

### 3.3 Geology, Fluvial Geomorphology, and Soils

This section addresses geologic, fluvial geomorphic, and soils issues related to implementation of the Proposed Action. The following evaluation is based on review of existing literature and data, along with information obtained in conjunction with the wetland delineation, reconnaissance-level assessment of the local geologic and geomorphic conditions, and detailed geomorphic mapping provided by the TRRP. Hydrology, groundwater, and water resources issues are evaluated in Section 3.4 and water quality issues are evaluated in Section 3.5.

#### 3.3.1 AFFECTED ENVIRONMENT/ENVIRONMENTAL SETTING

##### Regional Geology

The Trinity River basin occupies portions of two parallel but distinct geologic provinces: the Coast Ranges Province and the inland Klamath Mountains Province. The presence of both provinces can be attributed to processes associated with plate tectonics, the interaction of mobile plates of the Earth's crust. In both cases, convergent motion of crustal (lithospheric) plates, where a relatively thin, dense oceanic plate collided with the thicker, more buoyant continental crust, has accreted material to the western edge of North America, uplifting and deforming it to produce the landscapes seen today.

The Coast Ranges Province, which consists chiefly of the well-known Franciscan Assemblage and its associated basal unit, the South Fork Mountain Schist, is composed of highly disrupted and generally unstable rocks of sedimentary and volcanic origin. It occupies a limited area (approximately 56,000 acres, or less than 3 percent of the basin) at the northwestern extremity of the watershed downriver from any proposed TRRP projects. The Coast Ranges of northern California represent recent and contemporary accretion and uplift of geologic materials associated with the development of the Cascadia Subduction Zone, which is also responsible for the formation of the Cascade Range of volcanoes to the north and east of the Trinity River basin, including Mt. Shasta and Mt. Lassen.

East of the Coast Ranges, the Klamath Mountains were assembled from older metamorphic and igneous intrusive or *plutonic* rocks. The majority of the Trinity River basin lies within the Klamath Mountain Province. This province is divided into the Eastern Klamath, Central Metamorphic, Western Paleozoic and Triassic, and Western Jurassic sub-provinces or *terranes*. These terranes were successively accreted against the western margin of North America over an approximately 300-million-year period of convergent motion of lithospheric plates. The Klamath Mountains represent one of the most complete records of the westward growth of the North American continent.

Plutonic intrusions into metamorphic rocks are distributed across the watershed. These are often informally termed *granitic* rocks or granite. Some of the larger intrusions include the Shasta Bally Batholith at the headwaters of Grass Valley Creek, and numerous plutons that form the granitic core of the Salmon-Trinity Alps. Granitic rocks are highly erodible; they weather into individual sand-size grains and are a chronic source of fine sediment to streams and rivers. Grass Valley Creek is a classic example of a tributary source of fine sediment to the Trinity River downstream of the TRD.

Several distinct sedimentary units occur within the watershed. The Weaverville Formation, a series of non-marine deposits, is exposed in fault-bounded valleys across the southeastern portion of the watershed. Younger terraces and floodplains occur in the largest river valleys in the watershed, and some older

alluvial deposits are located in higher topographic positions where uplift has occurred since their deposition. These deposits materials were the focus of large-scale placer gold mines that re-shaped alluvial landscapes of Trinity County since the 1850s. Glacially eroded materials, largely of granitic origin, add to the sediment input to the Trinity River system, particularly from streams that emanate from the Salmon-Trinity Alps (e.g., Rush, Weaver creeks).

### ***Mines and Mineral Resources***

The geologic properties of many of the terranes are related to their origins as oceanic crust and/or their intrusion by plutonic bodies; these properties have resulted in mineralization that is widely distributed across the watershed. Many minerals of economic importance, including gold, copper, zinc, chromite, manganese, platinum, silver, and mercury are present, and have been mined by a variety of methods from the advent of European settlement to the present. Historically, the principal mineral of economic importance was gold, and the Trinity River watershed had the greatest concentration of gold mines in California outside of the Sierra Nevada. Both hardrock (lode) mines and placer (alluvial gravel) mines are present in the watershed, with activity from 1848 to the present. The tailing deposits associated with large-scale placer mining provide a substantial source of aggregate required in various construction projects.

### **Local Geology**

The confluence of Indian Creek and Weaver Creek with the Trinity River occurs within the project boundary. Weaver Creek enters the Trinity River from the north at the lower end of the rehabilitation site. Indian Creek enters the river from the south, approximately 1 mile upstream of the Weaver Creek confluence. Both of these tributaries contribute substantial quantities of water, sediment, and organic material to the Trinity River.

Rocks of the Abrams Mica Schist unit of the Central Metamorphic Belt underlie the project area and are exposed on either side of the river. These rocks are very hard and durable, and weather to large, angular cobbles and boulders. Surficial deposits blanket the project area, and consist of recent and modern alluvial floodplain and terrace deposits and historic hydraulic and dredge tailings. Indian Creek provides a variety of alluvial materials that are stored in deltaic deposits at the confluence of the Trinity River. Weaver Creek also provides a reoccurring supply of alluvial material that influences the morphology of the Trinity River in the vicinity of the Douglas City Bridge.

### ***Mines and Mineral Resources***

Recent and ancient alluvial deposits were mined until the 1940s using a variety of techniques. Large-scale hydraulic mining was conducted at various locations near the project site, including the Union Hill Pond hydraulic pit located approximately 700 feet north of activity area C-3 on the right side of the river. The hydraulic mining operations used high water pressure to erode and mobilize large quantities of unconsolidated overburden from gold-bearing areas. Evidence of this activity can be seen from the banks of the Trinity River within the site boundary (e.g., exposed banks and erosional features). Large-scale bucket-line dredge operations were also common between 1930 and 1950. These activities resulted in tailing deposits that continue to influence the form and function of the Trinity River. These tailing deposits can be observed along the right bank of the Trinity River within the vicinity of activity areas U-1, U-2 and U-3.

Since World War II, mineral extraction activities have focused on aggregate resources, although some gold mining activity continues, primarily using suction dredging. Over time, aggregate mining of alluvial deposits and reworking of hydraulic tailings have resulted in additional channel modifications and changes in sediment supply.

### *Active Mining Claims*

The General Mining Law of 1872 is one of the major statutes that direct the federal government's land management policy. The law grants free access to individuals and corporations to prospect for minerals in public domain lands, and allows them, upon making a discovery, to stake (or "locate") a claim on that deposit. Those sections of the Trinity River that are under federal jurisdiction are therefore open to prospecting.

A number of placer mining claims exist along the Trinity River. Placer claims are established with the intent to sort unconsolidated alluvial materials for precious metals (i.e., gold, platinum). Suction dredging is the principal mining method used for these claims, typically during low-flow periods when alluvial features are exposed or accessible. There are currently no placer mining claims within the boundary of or adjacent to the rehabilitation site. The closest placer mining claim to the rehabilitation site occurs in Lewiston, approximately 5 miles upstream of the site. Mining at this site is intermittent and there has been no mining activity associated with this claim for several years (Hitt, pers. comm. 2006). Proposed rehabilitation activities are not likely to disturb materials at this claim or disrupt any ongoing mining developments and activities within the site boundary or elsewhere.

There are currently no approved mining activities operating under the sanctions of the 1872 mining law or a County Surface Mining and Reclamation Act (SMARA) permit in the near vicinity of the rehabilitation site that would conflict with the Proposed Action. There are, however, three active aggregate mining claims several miles downstream of the rehabilitation site near Junction City operating under SMARA permits. A sand and gravel extraction company is currently operating at the site of the historic La Grange Hydraulic Gold Mine, upstream of Junction City, and there are two active sand and gravel extraction sites associated with the Hocker Flat project. In fact, the Hocker Flat project included the reclamation of one of these sites.

### **Regional Fluvial Geomorphology**

Fluvial geomorphology was fundamental in the evaluation and selection of the preferred alternative for the FEIS/EIR. Addressing the relationships between flow, sediment, and vegetation formed the basis for the Implementation Plan (Appendix C of the FEIS/EIR). This plan identified a number of actions concerning flow and sediment that would be implemented. These actions included:

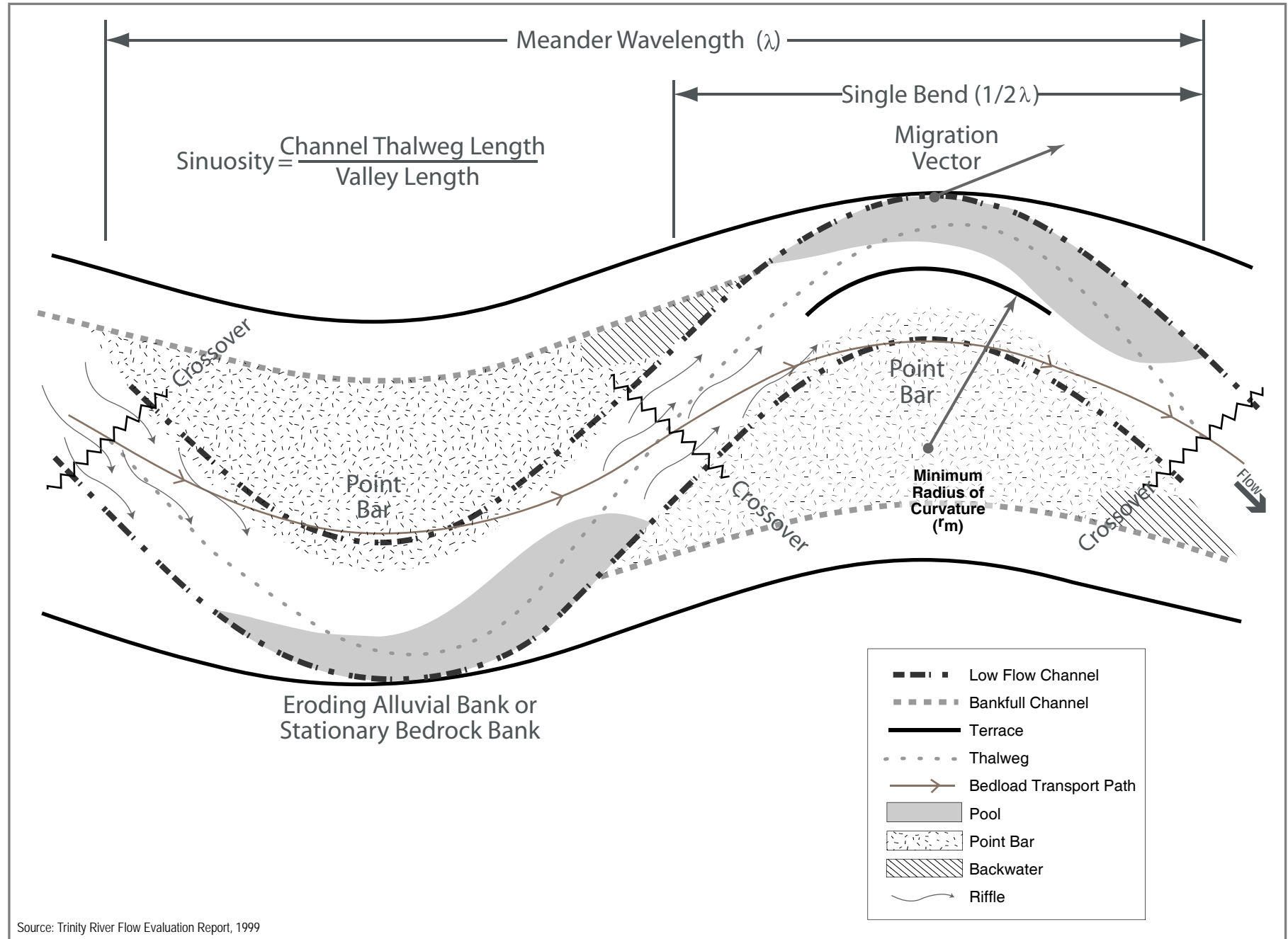
- instream release volumes to the Trinity River (dam releases, storage, timing)
- mechanical rehabilitation (high flow and channel projects)
- coarse and fine sediment management program (coarse augmentation, fine control)
- infrastructure modifications (bridges, structure relocations)
- watershed protection program
- adaptive environmental assessment and management

River channels are formed and maintained by the dynamic interaction of three primary components: sediment of various size classes, varying quantities and ages of vegetation, and varying amounts of water. Complex interactions between these three components define the geomorphic environment and provide a diversity of physical structures, such as point bars and riffle-pool sequences, that perform a variety of environmental functions. The resulting geomorphic environment typically supports a unique ecosystem that depends on geomorphic processes to maintain its fundamental structure. A change in one or more of these components would change the geomorphic environment (U.S. Fish and Wildlife Service et al. 2000b).

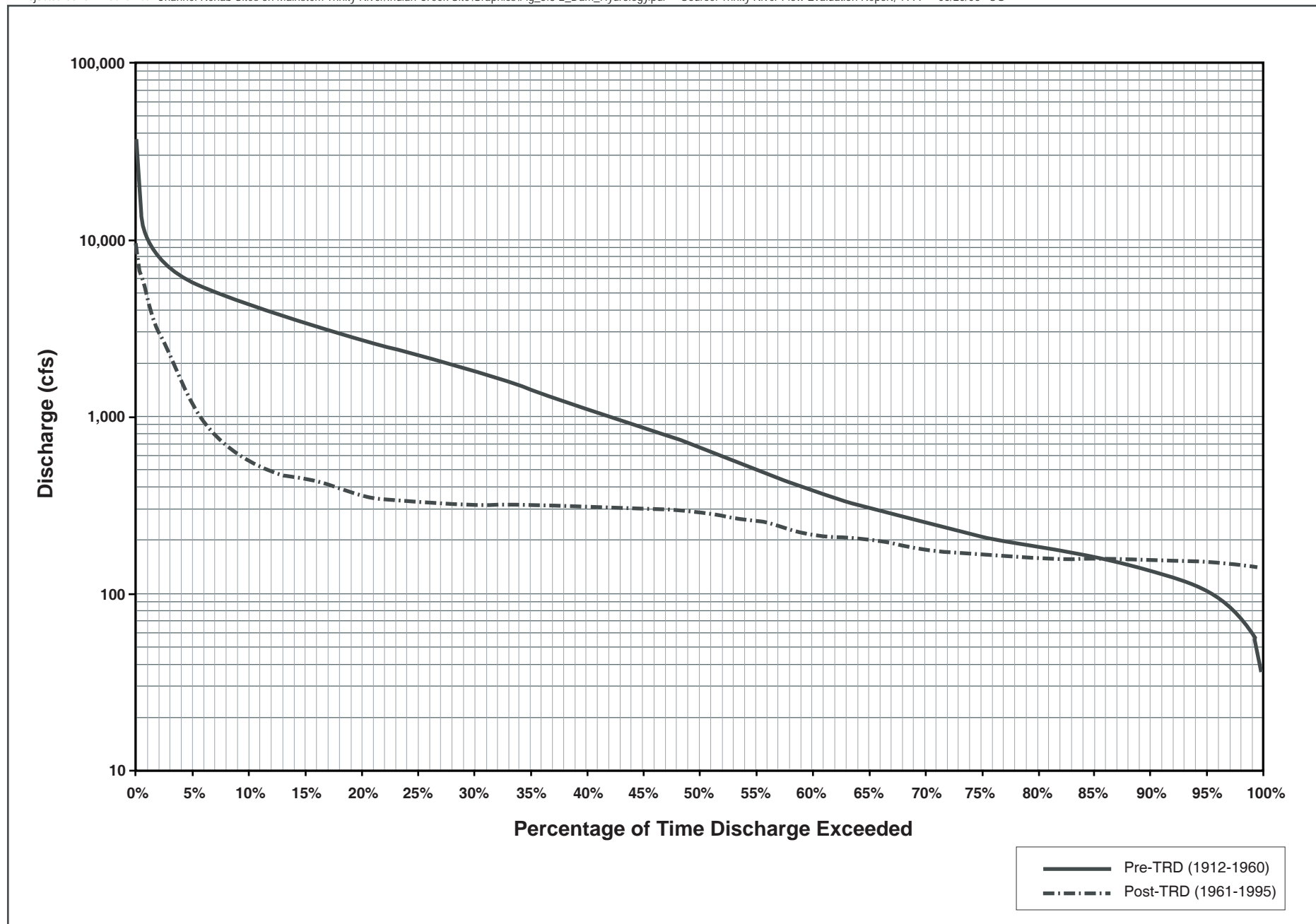
Generally, a highly variable flow regime in an alluvial river system results in a physically complex river that provides substantial ecological benefits. This complexity provides a variety of riverine and riparian habitats that can be used by different species under a range of flows. Varying flows impart varying amounts of energy throughout a river channel and elicit varying responses in the river channel. Flows can mobilize and deposit a wide range of sediment particle sizes (ranging from fine material to large boulders during peak events). This movement and deposition of sediment particles in turn scour and shape the river channel, creating river bars, pools, and riffles, and can force the main channel to shift its position in the floodplain (Figure 3.3-1). Within the scour zone, vegetation on gravel bars is inhibited by the depth and duration of flow.

The construction of the TRD replaced the Trinity River's pre-dam hydrology with a greatly reduced, near-constant flow schedule (Figure 3.3-2) from 1960 to 2004. This reduction in water and associated energy has directly affected the character of the channel (Figure 3.3-3). The new, lower flows allowed woody riparian vegetation (e.g., willows, alders) along the channel to become established and to mature. Sediment berms developed along the channel margins. These berms further anchored the sides of the channel and resulted in the loss of many broad, gently sloping point bars, thereby converting the pool-riffle-run sequences created by alternate bar sequences to a largely monotypic run habitat. The loss of these bars has substantially reduced the complexity and diversity of riparian and riverine habitats (McBain and Trush 1997). These changes in geomorphic processes and channel geomorphology have decreased the quantity and quality of these habitats.

Ten attributes were identified in the Trinity River Flow Evaluation Report (U.S. Fish and Wildlife Service and Hoopa Valley Tribe 1999) and used in the FEIS/EIR to describe the geomorphic environment and processes of a healthy alluvial river. These attributes were developed specifically for the Trinity River based on an in-depth historical and literature search (McBain and Trush 1997) and a comparison of pre- and post-dam conditions in the watershed. The comparison was largely based on aerial photographs taken before and after dam construction. The healthy river attributes provide a foundation for understanding the dynamic equilibrium of the river, and were used to develop recommendations to meet rehabilitation objectives. The "healthy river" attributes described in the FEIS/EIR provide a benchmark for evaluating potential strategies for improving the fishery within the mainstem Trinity River. The methodology used in the FEIS/EIR assumed that if all 10 of these attributes were present, the Trinity River would have the physical characteristics to support a healthy alluvial river ecosystem.

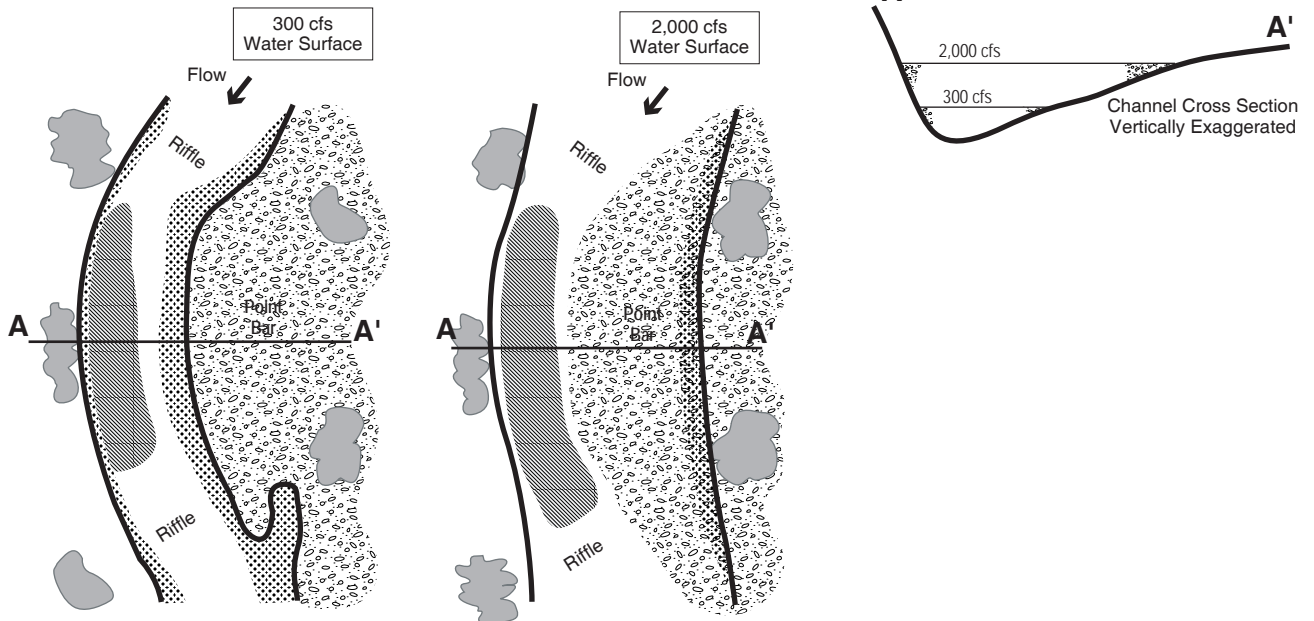


**Figure 3.3-1.**  
**Alternate Bar Formation**

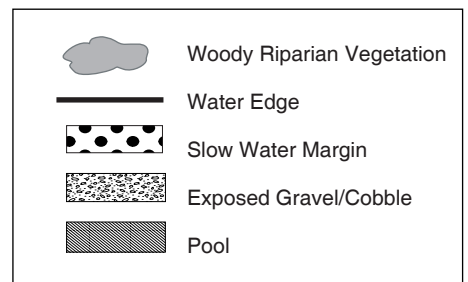
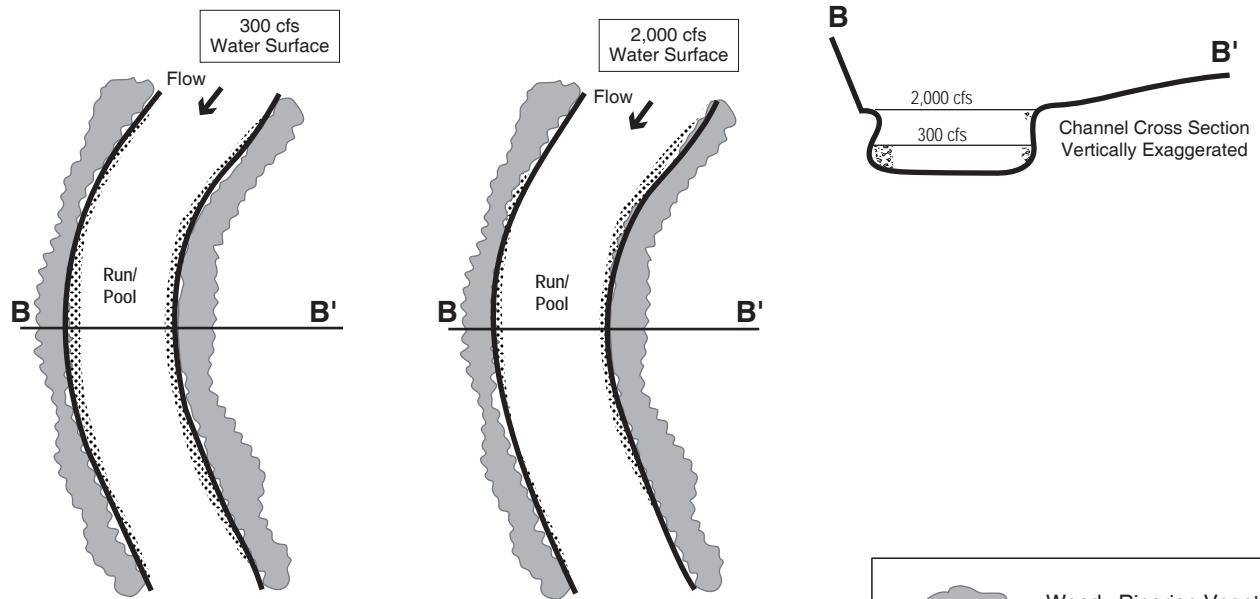


**Figure 3.3-2**  
**Pre- and Post-dam Hydrology**

## Pre-Dam Conditions



## Present Conditions



Source: McBain and Trush, Inc.

**Figure 3.3-3**  
**Simplified Geomorphology**

These attributes are listed below:

- Attribute 1: Spatially complex channel geomorphology
- Attribute 2: Flows and water quality are predictably unpredictable
- Attribute 3: Frequently mobilized channel bed surface
- Attribute 4: Periodic channel bed scour and fill
- Attribute 5: Balanced fine and coarse sediment budgets
- Attribute 6: Periodic channel migration
- Attribute 7: A functional floodplain
- Attribute 8: Infrequent channel resetting floods
- Attribute 9: Self-sustaining diverse riparian plant community
- Attribute 10: Naturally fluctuating groundwater table

### Local Fluvial Geomorphology

The geomorphic environment of the rehabilitation site is directly affected by the hydrology, channel bed composition and sediment regimes, and riparian vegetation within the project area. The rehabilitation site contains a number of distinct morphological features (i.e., berms, deltas, pointbars, floodplains). These features support habitat components that depend on a variety of physical processes to maintain their fundamental structure. Modification of the channel and floodplain configurations at the rehabilitation site has altered and simplified the natural diversity of geomorphic processes and energy regimes available for maintenance of a variety of channel forms, habitats, and vegetation structures.

Figure 3.3-3 illustrates the generalized geomorphic setting of a typical channel segment similar to that of the Proposed Action. Figures 3.3-4a and 3.3-4b characterize the geomorphic features at the rehabilitation site. Extensive modification of channel forms and other alluvial landforms is evident based on the distribution of natural and human-caused features observed (i.e., point bars and tailings piles). The construction and operation of the TRD caused formation of riparian berms along the channel margins. This has occurred in response to the establishment of persistent stands of riparian vegetation due to the elimination of scour by high seasonal flows. These berms have effectively reduced the sinuosity of the channel and inhibited the development and migration of alternate point bars. While floodplain features persist, the presence of the tailings deposits and the riparian berms has reduced access to the floodplain for the most frequently recurring floods and diminished the river's ability to regulate overbank flows during higher flow events.

### Geologic Hazards

#### *Seismicity and Seismic Hazards*

Seismicity refers to the geographic and historical distribution of earthquakes, while seismic hazards refer to the risk of loss from damaging earthquakes. According to the Reclamation Dataweb (<http://www.usbr.gov/dataweb/dams/ca10196.htm>), the infrastructure of the TRD (e.g., dams, tunnels, powerhouses) is located in a region of low historical seismicity and few known Quaternary faults. The region, however, may be subject to low to moderate levels of ground shaking from nearby or distant earthquakes.



Path: R:\Projects\10010 Mechanical Channel Rehab Sites on Mainstem Trinity River\GIS\Site-Indian Creek\10010 IndianCrik\_Fig. 3.3-4a\_Geomorphology.mxd Source: NSR, Inc.; USBR; USGS 03-22-06 bmoore

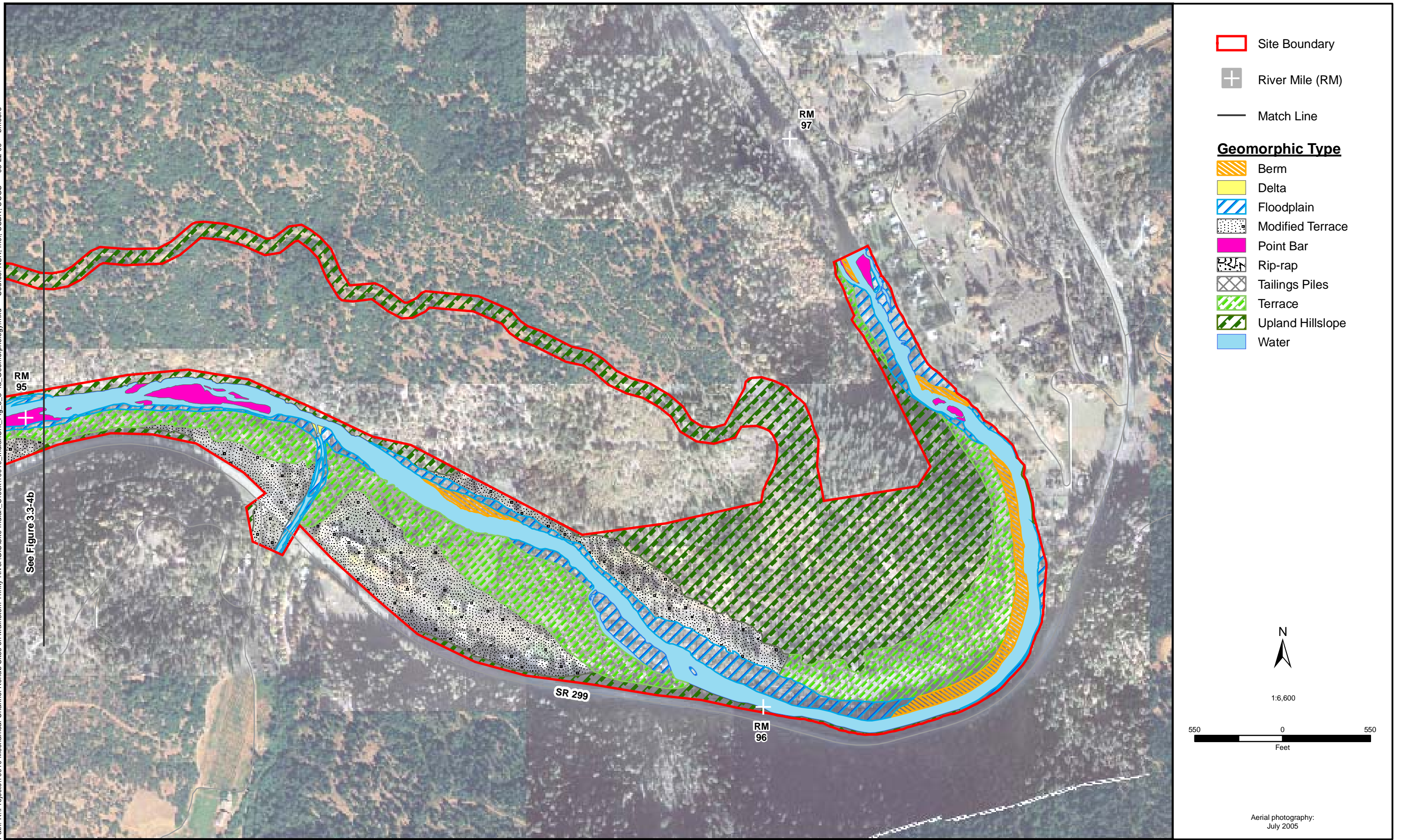
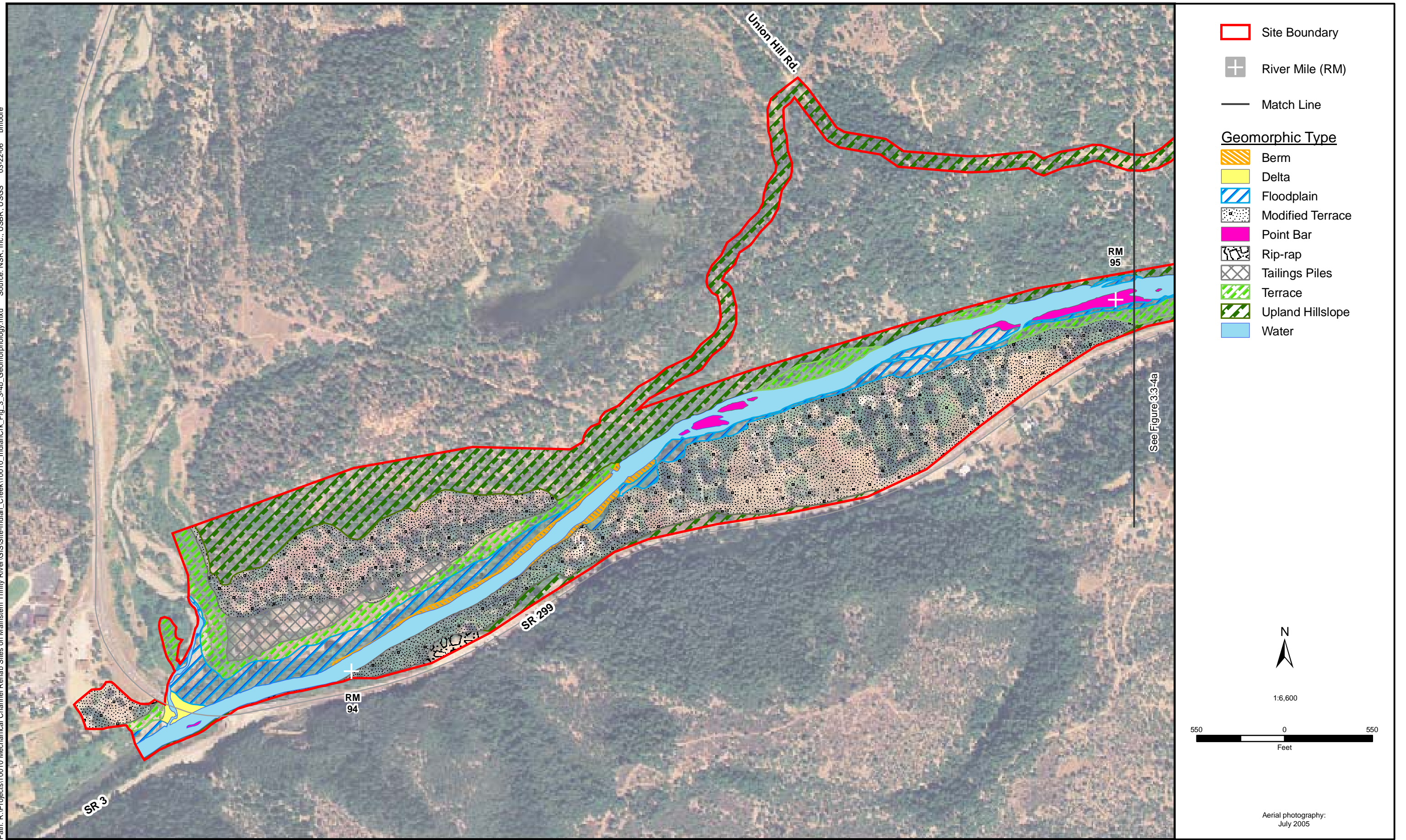


Figure 3.3-4a  
Geomorphology





**Figure 3.3-4b**  
**Geomorphology**

The most recent (2003) Probabilistic Seismic Hazards Assessment Model for California (California Geological Survey/USGS, <http://www.consrv.ca.gov/cgs/rghm/pshamap/pshamain.html>) describes the peak ground acceleration (Pga) with an exceedance probability of 10 percent in 50 years as falling at approximately 0.18 Pga on firm rock, approximately 0.2 Pga on soft rock, and approximately 0.24 Pga on alluvium for the Indian Creek rehabilitation site as well as for upstream areas that include the TRD facilities.

Seismic hazard ratings increase markedly west of the rehabilitation site due to the presence of numerous active seismic structures in the north coastal region of California. Peak accelerations of 0.3-0.4 Pga are forecast under the seismic hazards model of the Trinity River watershed downstream of Helena, California. A de-aggregated seismic hazard map of California (Peterson et al. 1996) can be found at <http://www.consrv.ca.gov/cgs/rghm/psha/ofr9608/index.htm>. This reference indicates that west-central Trinity County falls within the categories of furthest or second-furthest distance from earthquakes causing the dominant hazard for peak ground acceleration (50-200 km), with the strongest earthquake (8.5 [MW] or greater) necessary to create that hazard. These identified hazard ratings are related to the possibility of seismicity on the northern portion of the San Andreas fault zone and related fault splays in the northern Coast Ranges, and, more importantly, along the Cascadia Subduction Zone along the western Humboldt and Del Norte County coast.

No local Quaternary faults have been identified, although little detailed mapping of Quaternary geologic features has been conducted in the area. Historic earthquake activity in the area has been very low. No areas of Trinity County are described or mapped as Fault-Rupture Hazard Zones under the Alquist-Priolo Earthquake Fault Zoning Act (California Department of Conservation Division of Mines and Geology 1999).

Maximum credible earthquakes (MCEs) were determined for potentially significant faults, including Likely, Hat Creek, Freshwater, Mendocino, and San Andreas. These MCEs have projected surface wave magnitudes that range from 7 to 8.5. A maximum Modified Mercalli Level of VI to VII was also estimated for local seismicity (Trinity County 2001). The Modified Mercalli scale describes the intensity of an earthquake's effects at a given locality. The Mercalli level described above generally equates to a widely felt, often frightening, but minimally to moderately damaging earthquake.

### *Liquefaction*

Liquefaction is a process whereby water-saturated granular soils are transformed to a liquid state during ground shaking. Loose to medium dense sands, gravels, and silts occurring below the water table are prone to liquefaction. The soils bordering the Trinity River in immediate proximity to the rehabilitation site are predominantly alluvial in nature. These soils have potential to experience liquefaction; however, no detailed analysis was conducted because the type of activities described in Chapter 2 of the EA/DEIR would not affect the potential for liquefaction or be affected by liquefaction were it to occur.

### *Landslides*

The potential for landslides triggered by seismic events is not considered significant at the rehabilitation site or upstream in the vicinity of the TRD, due to the low historical seismicity of the region. There is a potential for downstream areas with higher seismic risk and unstable geologic materials to experience

slope failures during seismic events. Possible effects of large downstream landslides could include temporary damming of the mainstem Trinity River, depending on the volume of failed material and the flow regime at the time of the event. It is unlikely that effects of such an event would persist for a sufficient period to affect the rehabilitation site.

Slope stability within the rehabilitation site is dependent on the underlying geology. The bedrock unit underlying the site is prone to rock fall and shallow debris slides associated with road cuts and other oversteepened slopes. Soils developed on these rock types are shallow and prone to surficial erosion. Although landslides are a common occurrence along SR 299, these features are typically intercepted by the highway and rarely contribute material to the river in the reach that includes the rehabilitation site.

### *Seiches*

Seiches could occur upstream at TRD facilities as result of seismic, meteorologic, or geologic activities. A seiche is an oscillation or standing wave in a body of water confined in a basin. Seiches commonly arise from a sudden local change in atmospheric pressure, accompanied by wind and, occasionally, tidal currents. They can also occur as the result of ground shaking caused by earthquakes, or by the force of large landslides or debris flows entering a water body. Local water bodies capable of generating a large-scale seiche include Trinity Lake, Lewiston Lake, and Grass Valley Creek Reservoir. The hazards associated with a seiche involve the overtopping or possible failure of these dams, with resultant modifications to the flow regime of the Trinity River (i.e., flooding). However, the likelihood of such an event is considered minimal.

### *Volcanic Activity*

Volcanic hazards in the general vicinity of the rehabilitation site are limited primarily to ash fall and minor seiches in Trinity and Lewiston lakes. There are three large active volcanoes in the Cascade Range in California—Lassen Peak, Mount Shasta, and the Medicine Lake Volcano—as well as numerous smaller vents. The distance (75 to 100 miles) from these volcanic centers suggests that the Proposed Action would not likely be significantly affected by a volcanic eruption (Trinity County 2001).

### *Soils*

The majority of the soils at the rehabilitation site are described in the Soil Survey of Trinity County, California, Weaverville Area (U.S. Department of Agriculture 1998). The entire area of the Indian Creek rehabilitation site is covered by this survey. Detailed soil descriptions and soil survey maps of the study area are presented in Trinity River Mechanical Channel Rehabilitation Project, Indian Creek Site, Delineation of Waters of the United States, Including Wetlands (North State Resources 2004) (Appendix C).

## **3.3.2 REGULATORY FRAMEWORK**

### **Local**

#### *Trinity County General Plan Goals and Objectives*

The Trinity County General Plan contains goals and policies designed to guide the future physical development of the county, based on current conditions. The General Plan contains all the state-required elements, including community development and design, transportation, natural resources, health and

safety, noise, housing, recreation, economic development, public facilities and services, and air quality. The following goals and policies related to geology issues associated with the Proposed Action, were taken from the applicable elements of the General Plan (Trinity County 2001). The General Plan includes the Douglas City Community Plan (Trinity County 1987).

### *County Wide Goals and Objectives*

#### *Environmental*

To strive to conserve those resources of the county that are important to its character and economic well-being:

- By assuring that developments occurring on these lands are compatible with the resources.

#### *Conservation Element*

The following goals, objectives, and policies are applicable to the Proposed Action.

To conserve, preserve and maintain the habitat for wildlife species, plant life and the environment:

- By planning for mineral production and performance so as to avoid destruction, pollution or degradation of surrounding land, water and air resources. After mineral extraction has been completed, land used for mineral production should be revegetated and restored to its natural condition.
- By identifying all geologic and soil areas and developing standards for restricted development of any hazard areas.

#### *Safety Element*

The following goals, objectives, and policies are applicable to the Proposed Action.

#### *Seismic Safety Goal*

- A. Reduce the threat to life and property from seismic and geologic hazards.
- B. Promote safety from seismic and geologic hazards
  - Geologic hazards and seismic safety shall be considered in the preparation of environmental documents as required by CEQA.
  - The County shall confirm that all construction and grading activities done will not adversely affect the stability of any slope.

### *Trinity County Zoning Ordinance*

#### *Section 12. Mining (Ordinance. No. 315-230, Ordinance. No. 315-596)*

Purpose: To provide for the extraction of minerals, essential to the continued economic well-being of the County, while ensuring that mined lands are reclaimed to prevent or minimize adverse effects on the environment and to protect the public health and safety.

### *Section 30. General Provisions and Exceptions*

Use: All of the uses listed in this Section [Section 30], and all matters related directly thereto are declared to be uses possessing characteristics of such unique and special classification as making practical their inclusion in any class of use set forth in the various districts defined herein, and therefore the authority for and location of any of the uses designated shall be subject to the issuance of a Use Permit in accordance with the provisions of [Section 32] hereof.

### *Douglas City Community Plan*

The Douglas City Community Plan covers approximately 35 square miles (22,400 acres) centered on the Trinity River from Grass Valley Creek to an area known as Steiner Flat, downstream of Douglas City.

#### *Hazards*

This element of the Douglas City Plan is intended to minimize or preclude the occurrence of erosion, landslide, and/or the effects of other geologic events within a project area by identifying potential problem areas and implementing the following goal:

**Goal:** To deter development away from unstable slopes or soils.

#### *Natural Resources*

This element of the Douglas City Plan is intended to identify and protect the various natural resources found within the Plan area by implementing the following goal:

**Goal:** Encourage the continued use of suitable lands for resource production purposes.

- Encourage the sound use of mineral resources, especially sand and gravel operations that also reduce the sedimentation in the Trinity River.

#### *Land Use*

**Goal:** To encourage the retention and utilization of resource land for timber production, agricultural uses, and mineral extraction.

- Encourage mineral extraction activities, especially gravel extraction uses within the Trinity River.

### *Project Consistency with the Trinity County General Plan and Community Plans*

This section compares the goals and objectives of the Proposed Action to the relevant local planning policies (i.e., Trinity County General Plan, Douglas City Community Plan) to determine if there are any inconsistencies.

The goals and objectives described in Chapter 1 are generally compatible with the applicable General Plan goals and policies summarized above. The overall goal of the Proposed Action is to rehabilitate the site so that it functions in a manner that is closer to historic conditions (e.g., pre-Lewiston Dam).

### 3.3.3 ENVIRONMENTAL CONSEQUENCES/IMPACTS AND MITIGATION MEASURES

#### Methodology

Data for the following analysis were taken from existing reports on local and site-specific geology as well as on-site assessments during field reviews. These reports include the following documents: Soil Survey of Trinity County, California, Weaverville Area (U.S. Department of Agriculture 1998); Indian Creek Site Delineation of Waters of the United States, including Wetlands (North State Resources 2005), FEIS/EIR; Trinity River Maintenance Flow Study Final Report (McBain and Trush 1997); Trinity County General Plan; and previously cited online and Geographic Information Systems (GIS) data sources.

#### Criteria for Determining Significance

A project would have a significant impact related to geology, geomorphology, and soils if it could subject people, structures, or other resources to geologic or seismic hazards or disrupt, eliminate, or otherwise render unusable geologic or soil resources. Significant impacts would occur if the Proposed Action would:

- expose people, structures, or critical utility facilities to major geologic hazards (including seismicity, landslides, seiches, and liquefaction);
- involve changes in topography that would result in unstable soil conditions;
- increase erosion rates to a level at which associated sedimentation levels could affect streams, rivers, or other water bodies;
- interfere with existing, proposed, or potential development of mineral resources; and/or
- be inconsistent with the 10 Trinity River healthy alluvial river attributes.

#### Impacts and Mitigation Measures

Table 3.3-1 summarizes the potential geology, fluvial geomorphology, and soils impacts resulting from construction and operation of the Proposed Action.

**TABLE 3.3-1**  
SUMMARY OF GEOLOGY AND SOILS IMPACTS FOR THE NO-ACTION ALTERNATIVE, PROPOSED ACTION, ALTERNATIVE 1, AND ALTERNATIVE 2{ **TC "TABLE 3.3-1 SUMMARY OF GEOLOGY AND SOILS IMPACTS" IF B \L "1"** }

No-Action Alternative	Proposed Action	Alternative 1	Alternative 2	Proposed Action with Mitigation	Alternative 1 with Mitigation	Alternative 2 with Mitigation
<b>Impact 3.3-1 Implementation of the project could result in the exposure of structures and people to geologic hazards, including ground shaking and liquefaction.</b>						
NI	NI	NI	NI	N/A <sup>1</sup>	N/A <sup>1</sup>	N/A <sup>1</sup>
<b>Impact 3.3-2 Construction activities associated with the project could potentially result in increased erosion and short-term sedimentation of the Trinity River.</b>						
NI	S	S	S	LS	LS	LS
<b>Impact 3.3-3 Implementation of the project would interfere with existing, proposed, or potential development of mineral resources.</b>						
NI	NI	NI	NI	N/A <sup>1</sup>	N/A <sup>1</sup>	N/A <sup>1</sup>

Notes:

LS = Less than Significant      S = Significant      SU = Significant Unavoidable  
NI = No Impact                      B = Beneficial      N/A = Not Applicable

<sup>1</sup>Because this potential impact is less than significant, no mitigation is required.

**Impact 3.3-1:** Implementation of the project could result in the exposure of structures and people to geologic hazards, including ground shaking and liquefaction. ***No Impact for No-Action Alternative, Proposed Action, Alternative 1, and Alternative 2***

*No-Action Alternative*

Under the No-Action Alternative, no construction activities would occur. There would be no new exposure of structures and people to geologic hazards.

*Proposed Action, Alternative 1, and Alternative 2*

Under the Proposed Action, Alternative 1, and Alternative 2, no permanent structures or facilities would be constructed. There would be no new exposure of structures and/or people to geologic hazards.

*Mitigation Measures*

*No-Action Alternative, Proposed Action, Alternative 1, and Alternative 2*

Since no significant impact was identified, no mitigation is required.

*Significance After Mitigation: N/A.*

**Impact 3.3-2:** Construction activities associated with the project could potentially result in increased erosion and short-term sedimentation of the Trinity River. ***No Impact for No-Action Alternative; Significant Impact for Proposed Action, Alternative 1, and Alternative 2***

*No-Action Alternative*

Under the No-Action Alternative, the project would not be constructed. Therefore, no construction-related erosion or associated sedimentation of the Trinity River would occur.

*Proposed Action, Alternative 1, and Alternative 2*

Construction of the Proposed Action, Alternative 1 and Alternative 2 would temporarily result in soil disturbance, soil compaction within proposed access road and construction staging areas, disruption of soil cohesion and armoring, and increased soil exposure to energetic weather conditions, which would increase the short-term potential for wind and water erosion. Increased wind and water erosion and associated downstream sedimentation within the Trinity River would occur if any soils were left exposed during the later winter and early spring periods of high precipitation. Impacts of turbidity levels specific to water quality degradation are analyzed in Section 3.5, Water Quality, and associated impacts to anadromous fisheries are analyzed in Section 3.6, Fishery Resources.

Susceptibility to erosion is controlled by several factors, including terrain, land use, vegetation, soil type, and local climate. A soil with high erodibility typically experiences more erosion than a soil with low erodibility. However, in the absence of an adverse condition (i.e., rainfall, lack of vegetation), a soil that is classified as highly erodible may not experience significant erosion. In general, significant soil erosion would occur only at locations at the margins of constructed features (e.g., feathered edges, side channels, floodplains) where a combination of fine sandy to silty soils occurs.



For comparative purposes, Table 3.3-2 shows the area and volume of materials that would be excavated (cut) from the treatment areas, the area and volume that would be placed in upland activity areas (fill), and the acreage of staging areas, access roads and river crossings that would be subject to soil compaction under the Proposed Action, Alternative 1 and Alternative 2.

**TABLE 3.3-2**  
AREA AND VOLUME OF SOIL DISTURBANCE UNDER THE PROPOSED ACTION, ALTERNATIVE 1,  
AND ALTERNATIVE 2 { TC "TABLE 3.3-2 AREA AND VOLUME OF SOIL DISTURBANCE" \F B \L "1" }

Activity Type	Proposed Action	Alternative 1	Alternative 2
Riverine Treatment Areas (acres) yards <sup>3</sup>	(27.5) 136,000	(27.5) 136,000	(22.08) 106,000
Upland Activity Areas (acres) yards <sup>3</sup>	(7.9) 122,500	(7.9) 122,500	(5.23) 92,000
Staging Areas/Access Roads/River Crossings (acres)	(12.1)	(30.69)	(8.99)
<b>(Total acres) Total yards<sup>3</sup></b>	<b>(47.5) 258,500</b>	<b>(66.09) 258,500</b>	<b>(36.30) 198,000</b>

The potential for increases in soil erosion and sedimentation is considered a significant impact under each of the alternatives. However, soil compaction that would occur as a result of construction staging and access road areas would be less for the Proposed Action than Alternative 1 because there would be no construction of the access road to the north of the activity areas. Alternative 2 would result in less disturbed area and substantially less volume in terms of material excavated and displaced than the Proposed Action and Alternative 1 because this alternative would not include implementation of activity areas R-1, U-1, U-2, and staging area C and therefore no road access would be required. Although the area and volume of material that would be affected under Alternative 2 are less than under the Proposed Action and Alternative 1, the potential for increases in soil erosion and sedimentation are considered a significant impact.

### *Mitigation Measures*

#### *No-Action Alternative*

Since no significant impact was identified, no mitigation is required.

#### *Significance After Mitigation: N/A.*

#### *Proposed Action, Alternative 1, and Alternative 2*

**2a:** Reclamation or its contractors shall implement the following measures during construction activities:

- Areas where ground disturbance would occur shall be identified in advance of construction and limited to only those areas that have been approved by Reclamation.
- All vehicular construction traffic shall be confined to the designated access routes and staging areas.
- Disturbance shall be limited to the minimum necessary to complete all rehabilitation activities.

- All supervisory construction personnel shall be informed of environmental concerns, permit conditions, and final project specifications.

**2b:** Reclamation or its contractors shall prepare an erosion and sedimentation control plan (Storm Water Pollution Prevention Plan [SWPPP]). Measures for erosion control will be prioritized based on proximity to the river. The following measures shall be used as a guide to develop this plan:

- Restore disturbed areas to pre-construction contours to the fullest extent feasible.
- Salvage, store, and use the highest quality soil for revegetation.
- Discourage noxious weed competition and control noxious weeds.
- Clear or remove roots from steep slopes immediately prior to scheduled construction.
- Leave drainage gaps in topsoil and spoil piles to accommodate surface water runoff.
- To the fullest extent possible, cease excavation activities during significantly wet or windy weather.
- Use bales and/or silt fencing as appropriate.
- Before seeding disturbed soils, work the topsoil to reduce compaction caused by construction vehicle traffic.
- Rip feathered edges (and floodplain surfaces where appropriate) to approximately 18 inches depth. The furrowing of the river's edge will remove plant roots to allow mobilization of the bed, but will also intercept sediment before it reaches the waterway.
- Spoil sites shall be located such that they do not drain directly into a surface water feature, if possible. If a spoil site drains into a surface water feature, catch basins shall be constructed to intercept sediment before it reaches the feature. Spoil sites shall be graded and vegetated to reduce the potential for erosion.
- Sediment control measures shall be in place prior to the onset of the rainy season and will be monitored and maintained in good working condition until disturbed areas have been revegetated. If work activities take place during the rainy season, erosion control structures must be in place and operational at the end of each construction day.

Reclamation will develop the erosion and sedimentation control plan in conjunction with BLM and the Regional Water Board and in cooperation with the NMFS, and CDFG. Reclamation's project manager will ensure the preparation and implementation of an erosion and sediment control plan prior to the start of construction.

*Significance After Mitigation: Less than Significant*

**Impact 3.3-3:** Implementation of the project would interfere with existing, proposed, or potential development of mineral resources. *No Impact for the No-Action Alternative; Less-than-Significant Impact for the Proposed Action, Alternative 1, and Alternative 2*

*No-Action Alternative; Proposed Action, Alternative 1, and Alternative 2*

There are no current or proposed mining activities operating under either a federally authorized operating plan or through a County SMARA permit within the vicinity of the rehabilitation site (Hitt, pers. comm. 2006). Therefore, there would be no impacts to mineral activities under any of the alternatives.

***Mitigation Measures***

*No-Action Alternative, Proposed Action, Alternative 1, and Alternative 2*

Since no significant impact was identified, no mitigation is required.

***Significance After Mitigation:*** N/A

### 3.4 Water Resources

This section describes the surface water hydrology and groundwater from both regional and local perspectives, as well as site-specific location hydraulics associated with the Indian Creek Rehabilitation Site: Trinity River Mile 93.7-96.5. The following evaluation is based on field investigations conducted to develop and calibrate the hydraulic model; a review of existing literature and data; and field reconnaissance to identify local water resource conditions, including private wells within the site boundary established for the proposed project. Geology, fluvial geomorphology, and soils issues are evaluated in Section 3.3. Fishery issues are evaluated in Section 3.6.

#### 3.4.1 AFFECTED ENVIRONMENT/ENVIRONMENTAL SETTING

##### Regional Hydrology

##### *Surface Water Hydrology*

Since 1960, the TRD has been the major determinant of the hydrologic conditions affecting the Trinity River in the reach downstream of Lewiston Dam. Accretion flow from tributaries to the Trinity River modify the flow regime and contribute water, sediment, and other materials throughout the water year (Figure 3.4-1). The Trinity River basin encompasses approximately 2,965 square miles, about one-quarter of which is upstream of the TRD. Elevations range from 9,025 feet (msl) at Mount Eddy at the northeastern extremity of the watershed to 300 feet msl at the confluence of the Trinity and Klamath rivers. The climate is Mediterranean, with an average precipitation of 62 inches per year; throughout the basin, precipitation varies from 30-70 inches annually and typically occurs as rain in the lower elevations and snow at the higher elevations.

The Trinity River is the largest tributary to the Klamath River. From its headwaters to its confluence with Klamath River at Weitchep, the mainstem Trinity River is 170 miles long (Figure 3.4-2).

Construction of the TRD commenced in 1957 and storage of Trinity River water began in 1960. The Lewiston and Carr Powerhouses commenced operation in April 1964. The TRD consists of a series of dams, tunnels, and powerplants that export water from the Trinity River basin into the Sacramento River basin. Trinity and Lewiston dams currently regulate Trinity River flows, particularly downstream of RM 112. With a capacity of 2.4 million acre-feet (maf), Trinity Lake is the largest component of the TRD. Discharges from Trinity Lake are regulated in Lewiston Reservoir prior to release downstream into the Trinity River. Lewiston Reservoir also acts as a forebay for the trans-basin export of water into Whiskeytown Reservoir via the Clear Creek Tunnel. Since the TRD was constructed, Lewiston Dam has marked the upstream limit of anadromous salmonid access on the Trinity River.

The reach of the Trinity River downstream of Lewiston Dam to the confluence with the North Fork Trinity River is most affected by the changes in hydrologic regimes imposed by the TRD. Tributaries contribute relatively little accretion flow to this reach on an annual basis, although certain components of the annual hydrograph are locally modified by various tributary inflows. Prior to authorization of the 2000 ROD, the average annual flow volumes released from the TRD into the Trinity River at Lewiston Dam were historically reduced by as much as 90 percent compared to pre-dam conditions. Consequently, channel form and function in this reach have been substantially altered.

Prior to the completion of the TRD, flows in the Trinity River were highly variable, ranging from summer flows of 25 cubic feet per second (cfs) to extreme winter events with instantaneous peak flows greater than 100,000 cfs. The maximum recorded flow at Lewiston was 71,600 in 1955. Annual hydrographs typically followed a seasonal pattern of high winter and spring flows followed by low summer and fall flows. Total annual flow volumes at Lewiston ranged from 0.27–2.7 maf, with an average of 1.2 maf.

From 1962 to 1979, CVP diversions delivered nearly 90 percent of the Trinity River annual water yield (above Lewiston) into the Sacramento River for urban and agricultural use<sup>1</sup>. After 1979, river releases were increased from 110,000 to 340,000 acre-feet (af) annually, thereby increasing the available flow in the Trinity River by as much as 70 percent.

Although the 2000 ROD established an annual volume based on water year types, litigation in federal court resulted in delayed implementation of the flow releases for water years 2001–2004. Ultimately the ROD was upheld, and the 2005 water year incorporated the schedule established by the TRRP in accordance with the ROD. This schedule is revised each year based on water year type. As the operator of the TRD, Reclamation is responsible for establishing the water year type every spring.

Periodically, increased water releases are made from Trinity Dam consistent with Reclamation safety of dams criteria intended to prevent overtopping of Trinity Dam. Although flood control is not an authorized purpose of the TRD, flood control benefits are provided through normal operations.

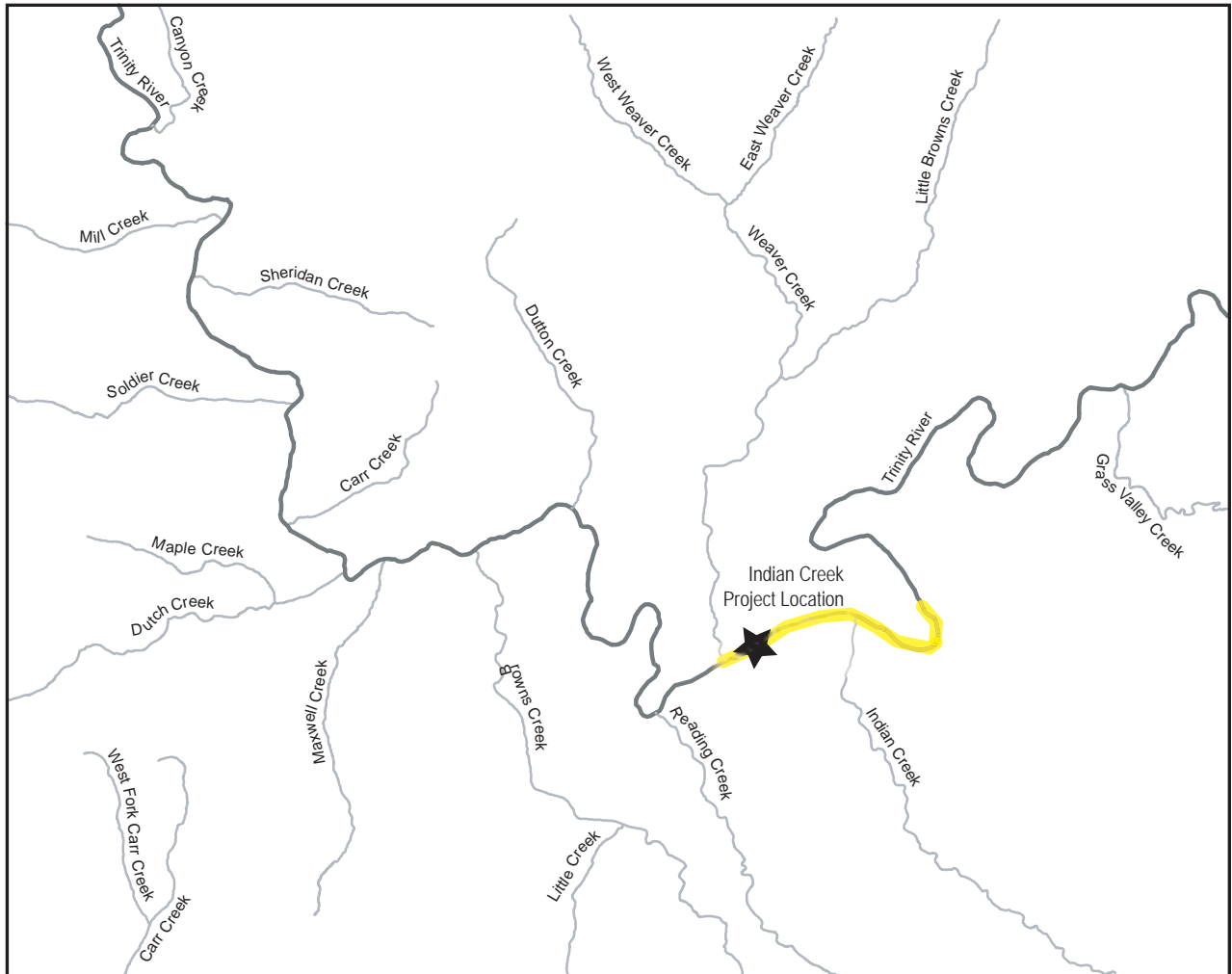
Trinity Dam has limited release capacity below the spillway crest elevation. Studies completed by the Corps in 1974 and Reclamation in 1975 showed the spillway and outlet works at Trinity Dam are not sufficient to safely pass the anticipated design flood inflow. Therefore, Reclamation implemented safety of dams criteria stipulating flood season release and storage criteria at Trinity Dam to reduce the potential for overtopping during large flood events. The safety of dams criteria attempt to prevent storage from exceeding 2.1 maf from November through March. The safety of dams criteria begin to prescribe reservoir releases when storage in Trinity Lake is forecast to exceed 2.0 maf during the November to March period.

The safety of dams release criteria specify that Judge Francis Carr Powerplant capacity should be used as a first-preference destination for safety of dams releases made at Trinity Dam. Releases to the Trinity River are made as a second-preference destination. During significant northern California high-water flood events, the Sacramento River water stages are also at concern level. Under such high water conditions, the water that would otherwise move through the Carr Powerplant is routed to the Trinity River.

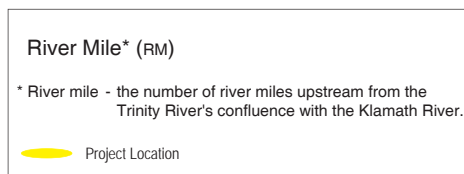
The flood season within the Trinity River basin is typically between October and April, when over 90 percent of the annual precipitation falls. Floods on the Trinity River are controlled to some extent by the TRD. The greatest flood recorded for the area occurred in December 1955, although the ungaged flood of 1861–1862 likely exceeded all known historical events. Floods have also been recorded for the years

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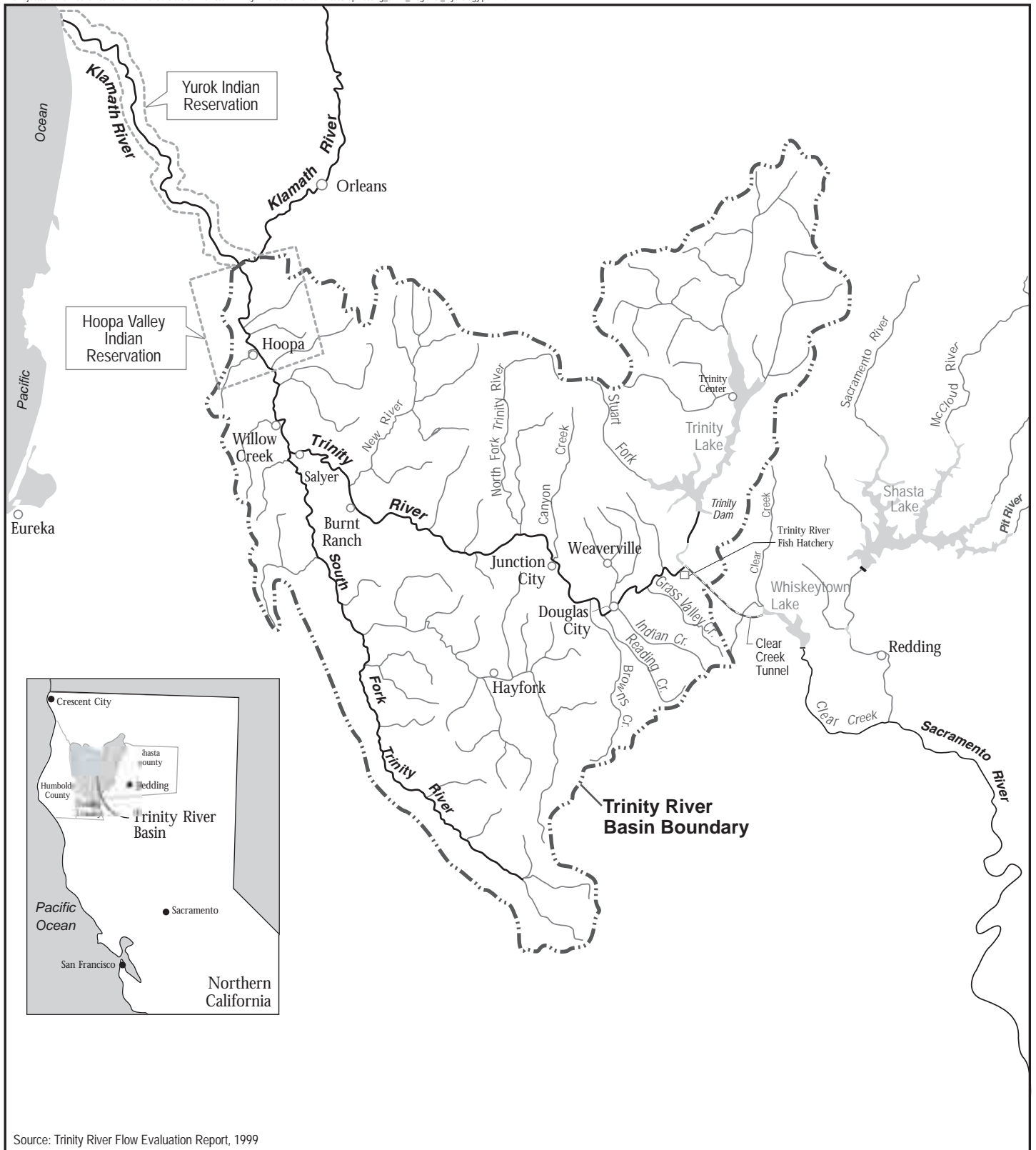
<sup>1</sup> The percentage of the Trinity River diverted to the CVP is the percentage of total reservoir release, not the percentage of the inflow.



Source: National Hydrography Dataset



**Figure 3.4-1**  
**Local Hydrology and Tributaries**



Source: Trinity River Flow Evaluation Report, 1999

Indian Creek Rehabilitation Site: Trinity River Mile 93.7 to 96.5



**Figure 3.4-2**  
**Regional Hydrology**

1926, 1928, 1937, 1940, 1941, 1948, 1950, 1958, 1960, 1963, 1964, 1972, 1974, and 1997 (Federal Emergency Management Agency 1996).

From Lewiston Dam downstream, a number of major tributaries provide accretion flow to the Trinity River before it enters the Klamath River. These tributaries include Rush Creek, Indian Creek, Weaver Creek, Canyon Creek, the North Fork Trinity River, Big French Creek, New River, South Fork Trinity River, Willow Creek, Horse Linto Creek, Tish Tang Creek, and Mill Creek.

The amount of winter precipitation increases steadily westward in the basin, as favorable orographic conditions extract more moisture from Pacific weather fronts closer to the coast and rain shadow effects reduce precipitation in the eastern portion of the watershed. Consequently, winter peak flows in the downstream portions of the Trinity River are much higher than those upstream, with greatly reduced influence from the control of flows by the TRD. Trinity River flows at the Hoopa gage average about 10,000 cfs from January through March. A peak flow volume of 122,000 cfs was recorded at the Hoopa gage during the January 1997 flood, although less than 7,000 cfs was released from Lewiston Dam.

During the seasonal dry period following peak spring snowmelt from the high mountainous areas of the watershed, flow accretion and its influence on mainstem hydrology decreases dramatically. During summer and fall baseflow periods, tributary accretion flows contribute minimally to low release volumes from the TRD. In general, during low-flow periods, flow accretion is minimal from Lewiston Dam to Canyon Creek, and becomes most significant downstream of the confluence with the North Fork Trinity River. However, during high flows (e.g., > 10 year recurrence interval), tributary accretion substantially exceeds dam release flows within 15–20 miles downstream of Lewiston Dam (McBain and Trush 1997). Tributary flow influence on this reach during flood events and as a proportion of the high range of average daily flows are a reversal of pre-dam conditions, where mainstem flows would almost always exceed the contribution of tributaries. Despite tributary contributions, flood frequency and peak flows in the uppermost reaches of the mainstem below the TRD are greatly reduced compared to pre-dam conditions.

### *Groundwater*

Most usable groundwater in the mountainous Trinity River basin occurs in widely scattered alluvium-filled valleys, such as those immediately adjacent to the Trinity River. These valleys contain only small quantities of recoverable groundwater, and, therefore, are not considered a major source. A number of shallow wells adjacent to the river provide water for domestic purposes. There are two wells at Indian Creek that were identified as at risk from higher ROD flows. These two wells have pumps that are not submersible and the wells themselves are not sealed. Residents have already been compensated for repairs and upgrades (Wiltse, pers. comm. 2006). Additionally, there are a number of wells that are designed to be inundated, and often are.

### **Local Hydrology**

#### *Surface Water Hydrology*

Within the project boundary, the Trinity River consists of a single channel that is typically constrained by riparian berms at flows less than 6,000 cfs. In general, the aquatic habitat within this reach of the river is



considered simplified, with a reoccurring sequence of runs and low-gradient riffle habitat, pools, and glides. Additional information on morphologic processes and aquatic habitat is provided in Section 3.3 and Section 3.6 of this document.

Flood flow estimates used in the hydraulic modeling analyses were taken from three sources:

- the Flood Plain Information Report: Trinity River Lewiston Lake to Junction City, Trinity County, California (U. S. Army Corps of Engineers, 1976);
- the Estimation of 50- and 100-Year Tributary Accretion Floods document (McBain 2002); and
- the Flood Plain Infrastructure Modifications Spring Flow Events draft report (U. S. Bureau of Reclamation 2005).

The 1976 Corps report provides the 100-year and 500-year annual flood events and hydraulic analyses used by FEMA to develop the current flood insurance rate maps (FIRMs) for the Trinity River. The 2002 McBain report provides flood flows as measured at mainstem Trinity River gages during the January 1997 flood and estimates of tributary accretion between mainstem gages during this event. The 2005 Reclamation draft report provides an estimate of 10-year and 100-year spring tributary flows during the time period when maximum fishery flows (MFF) (11,000 cubic feet per second [cfs]) would be occurring from Lewiston Dam. Because the 1976 Corps report provided flow rates only at Lewiston and Douglas City, the 2002 McBain report was used to approximate how flows would have accumulated between these locations if the flood assumed in the 1976 study were similar to that which occurred in 1997. Design flows, including the 1997 flood flows, used in this analysis are provided in Table 3.4-1.

**TABLE 3.4-1** { TC "Table 3.4-1 Design Flood Flows" \f B \l "1" }  
**DESIGN FLOOD FLOWS**

Location	Maximum Fishery Flow <sup>a</sup> (cfs)	1997 Flood <sup>b</sup> (cfs)	FEMA 100-Year Flood <sup>c</sup> (cfs)
Trinity River at Lewiston	11,000	6,000	8,500
Trinity River below Rush Creek	12,096	12,500	19,300
Trinity River below Grass Valley Creek	13,692	15,050	23,600
Trinity River above Indian Creek	14,549	15,200	23,800
Trinity River below Indian Creek	15,771	19,000	30,200
Trinity River below Weaver Creek	17,544	22,000	35,200
Trinity River below Reading Creek	18,613	24,000	38,500

Notes:

<sup>a</sup> MFF=11,000 cfs Lewiston Dam Release plus 100-year spring tributary flows (2005 Reclamation draft report)

<sup>b</sup> 2002 McBain report

<sup>c</sup> 1976 Corps report (used in FIRM study)

Table 3.4-1 and the data included in Appendix G show that the annual hydrograph is influenced by accretion flow from tributaries, thereby augmenting TRD releases. The timing of peak flow and ramping-down releases under the ROD corresponds to the typical annual period of peak snowmelt floods in the watershed for each of the various water year classes described in the ROD.

Two substantial tributaries, Indian and Weaver creeks, enter the Trinity River within the project boundary. These tributaries contribute flow, sediment, and other materials to the mainstem Trinity River throughout the year. Indian Creek consists of an unregulated 33.2-square-mile watershed that flows in a northerly direction where it joins the Trinity River between RM 95 and 96. Weaver Creek flows in a southerly direction from the town of Weaverville and enters the Trinity River at Douglas City near the downstream boundary of the project. Tributaries upstream of the project include Rush Creek, Grass Valley Creek, and Deadwood Creek.

The location hydraulic study (Appendix G) documents the approach used to develop and use a HECRAS model for the project. While designed to evaluate the impact of the Proposed Action on Trinity River flooding, the data in this appendix are also useful in evaluating the ability of the rehabilitation plan to achieve the goals of the Proposed Action: enhancing the 10 healthy alluvial river attributes and consequently improving salmonid habitat. The implementation of the Proposed Action would provide an opportunity to use the hydraulic models to evaluate the rehabilitated channel's ability to mobilize and redistribute sediments, maintain diverse riparian habitat, and improve the functionality of the floodplain.

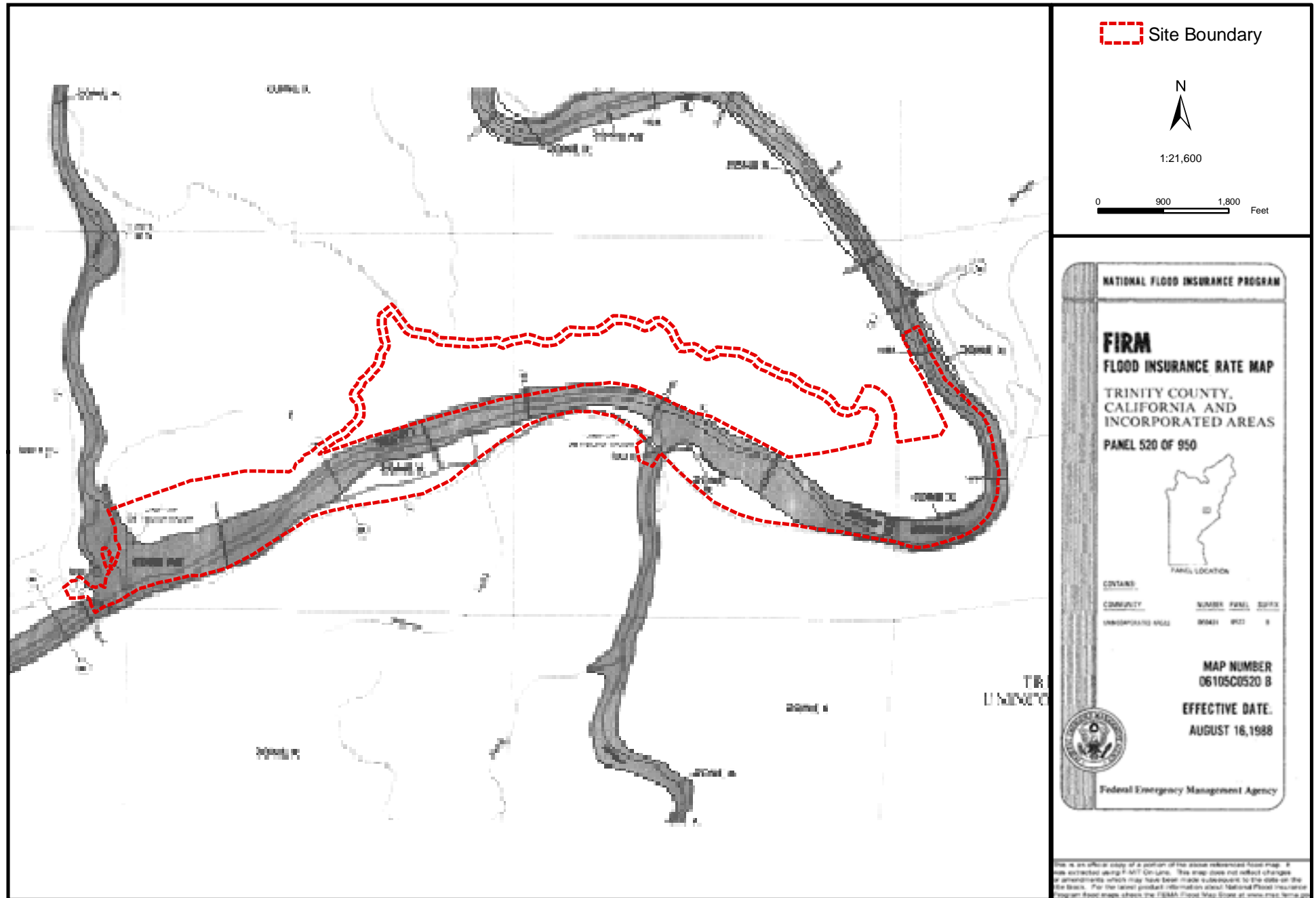
### *Groundwater*

While it is generally accepted that a hyporheic connection exists between shallow groundwater and the wetted channel in alluvial rivers, a number of variables influence this relationship. Given the alluvial nature of the Trinity River in the vicinity of Indian Creek, coupled with the relative abundance of coarse substrate within these alluvial deposits, dynamic hyporheic flow is likely to occur through these materials during some or all of most water years. Currently, existing off-channel wetlands appear to be responsive to changes in stage in the mainstem channel, although the uncertainties associated with variables such as time lag and/or attenuation, substrate composition, and evapotranspiration limit the ability to predict these changes. The chemical and biological components of groundwater exchange between wetlands, the hyporheic zone, the water table, and the channel may be responsive to various rehabilitation activities.

The Weaverville Community Services District (WCSD) operates an intake gallery located near the Weaver Creek–Trinity River confluence to extract groundwater adjacent to the Trinity River. The WCSD uses water from East and West Weaver Creeks in addition to water from the Trinity River to provide water services to approximately 1,600 customers in Douglas City and Weaverville. Due to a series of high flows since 1997, Weaver Creek has migrated westerly towards the WCSD intake, causing the intake gallery to pull more Weaver Creek water than Trinity River water. Weaver Creek water is often more turbid and therefore more problematic for filtration and treatment. The project design takes into account concerns regarding the intake gallery. Excavation in the Weaver Creek delta will increase the ability of Weaver Creek to migrate naturally across its delta.

### *Floodplain Hydraulics*

The floodplain of the Trinity River is identified in the Flood Insurance Study, Trinity County, California, and Incorporated Areas by the Federal Emergency Management Agency (FEMA). Actual floodplain designations are in the accompanying Flood Insurance Rate Map (FIRM). Figure 3.4-3 represents the delineation of the FIRM map as it pertains to the Proposed Action. The floodplain designations for the



**Figure 3.4-3**  
**100-year Floodplain and Flood Insurance Rate Map**

Trinity River in the general vicinity of the Indian Creek project were identified from a flood study performed by the Corps (U.S. Army Corps of Engineers 2004). The countywide FIRM map became effective on August 16, 1988.

The project boundary, excluding some upland areas, is within the 100-year floodplain designated by FEMA and within Special Flood Hazard Area Zones AE and X. Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. These AE zones correspond to locations where SR 299 is in close proximity to the Trinity River, namely, the bottom of Vitzhum Grade and the Douglas City Bridge. BFEs or depths are shown within this zone, although the channel geometry has changed substantially since these zones were delineated. Lenders require flood insurance within Zone A or AE. Zone X is the flood insurance rate zone that correspond to areas outside the 100-year floodplains, areas of 100-year sheet flow flooding where average depths are less than 1 foot, areas of 100-year stream flooding where the contributing drainage area is less than 1 square mile, or areas protected from the 100-year flood by levees. No BFEs or depths are shown within this zone.

Recent studies elsewhere on the river indicate that the flood magnitude determined by the 1976 Corps study may underestimate the actual flood magnitude and, therefore, the extent of the floodplain. As this project and other TRRP rehabilitation projects are implemented in the future, updated hydrological and topographical information could be used to revise the flood insurance study and flood insurance rate maps. This issue will be addressed at the appropriate time by FEMA and Trinity County. Under the County's Floodplain Management Ordinance, projects within the floodplain are not to increase the 100-year flood elevations by more than 12 inches. This criterion was used by the design team to ensure that actions proposed for each activity area are all feasible.

To gage the effect of the project on the floodplain, water surface profiles for the existing and proposed ground surfaces were developed as part of the hydraulic modeling used in project design. These profiles show that the activities proposed in the action alternatives will not increase flood elevations over current conditions. This criterion was used by the design team to ensure that actions proposed for each activity area are all feasible.

The study in Appendix G provides a detailed discussion of the efforts employed to analyze water surface elevations and channel velocities for design flows prescribed in the ROD. This study documents what, if any, effects the Proposed Action and alternatives will have on BFEs.

### 3.4.2 REGULATORY FRAMEWORK

#### Federal

##### *Federal Emergency Management Agency*

Projects encroaching on a designated floodplain, as established by the FEMA, are required to prepare a Location Hydraulic Study to assess risk in compliance with Executive Order 11988. A Location Hydraulics Study was prepared for the Proposed Action. This study provided the foundational hydrology used to design and evaluate the proposed federal project as set forth in FEMA procedures. It also

evaluates and discusses risks and impacts of base floodplain encroachment. The purpose of the evaluation is to ensure that all projects avoid significant floodplain encroachments where practicable.

Trinity County is a participant in the National Flood Insurance Program (NFIP). As a participant in the NFIP, the County is eligible for federal flood disaster assistance funds, including for damages to roads, bridges, and other public works infrastructure. In addition, federal flood insurance is made available to all property owners throughout the county. In return, the County is required to enforce at a minimum, the standards established by the FEMA. One of these standards requires that construction not result in a rise in the BFE for areas within a regulatory floodway. It also includes minimum standards for areas where no floodways have been established, such as portions of the Trinity River downstream of Canyon Creek. These standards state that no development shall be permitted unless it can be shown that it would not increase the water surface elevation of the base flood more than 1 foot at any point within the community. Minimum standards also require that a Letter of Map Revision be submitted to FEMA to correct the Flood Insurance Rate Map if base flood elevations increase or decrease.

#### *Federal Executive Order 11988 (Floodplain Encroachment)*

Trinity County's requirements under the Floodplain Management Ordinance will be followed to ensure compliance with Federal Executive Order 11988.

#### **Local**

##### *Trinity County Floodplain Management Ordinance*

The Trinity County Floodplain Management Ordinance, found in Section 29.4 of the County Zoning Ordinance, requires a Floodplain Development Permit for projects that alter the Trinity River floodplain on private lands within the jurisdiction of Trinity County. The principal requirement of the permit is certification by a registered professional engineer or architect that construction or replacement of bridges, roadways, and bank slope protection devices will not adversely affect the flood-carrying capacity of any altered portion of the watercourse, and will not cumulatively raise the 100-year floodplain elevations by more than 1 foot in the project boundary. The ordinance also requires notification of adjacent communities, the CDFG, the Corps, the Regional Water Board, and DWR prior to any alteration or relocation of a watercourse, and the submission of evidence of such notification to FEMA.

The Trinity County Floodplain Management Ordinance includes the following goals and policies:

##### *Flood Hazard (FH) Zoning District*

##### *Applicability of Flood Hazard (FH) Zoning District*

All of the following areas shall be zoned as FH:

- A. Areas designated as a Regulatory Floodway or Zone AE on FEMA's Flood Insurance Rate Maps (FIRM)
- B. Areas designated on the FIRM as Zone A along the Trinity River
- C. Areas identified as 100-year flood plain on parcel maps and final maps filed for record in accordance with the Trinity County Subdivision Ordinance

- D. Areas identified as 100-year flood plain in a use permit condition or other county entitlement
- E. Areas identified as 100-year flood plain by a flood study approved by the County Board of Supervisors

#### *Uses Permitted*

- A. Agricultural uses not involving the construction of structures or other uses which would limit the flow of flood waters
- B. Placement and repair of three strand smooth-wire or barbed-wire fencing
- C. Maintenance and repair of existing bridges, culverts, and roadways
- D. Recreational mining or dredging, not subject to the Surface Mining and Reclamation Act (SMARA)

#### *Uses Permitted Subject to First Securing a Floodplain Development Permit*

The following uses may be permitted subject to first securing a Director's Issued Floodplain Development Permit, and, where applicable, complying with Regulatory Floodway provisions excerpted from Section 2.5 of the Trinity County Floodplain Management Ordinance as listed below.

- A. Construction or replacement of bridges, culverts, roadways, bank slope protection devices and levees, and fisheries or wildlife habitat improvement projects shall be allowed, provided a certification by a registered professional engineer is provided demonstrating that the net effect of the project, in conjunction with all other projects developed on the affected stream reach since the effective date of the FIRM for said stream, will not cumulatively increase flood waters of the stream by more than one foot in the project boundary. Such certification shall be provided to the Floodplain Administrator.
- B. Substantial improvements to existing structures, subject to compliance with development standards in the Flood Hazard Overlay (FHO) zoning district.
- C. Development of structures within the FH zoning district may be permitted upon first securing Floodplain Development Permit, provided that there are no building sites lying outside of the FH zoning district. If approved, development shall comply with development standards in Section 3.4.

#### *Uses Permitted in Regulatory Floodways*

A "Regulatory Floodway," lying within an area of special flood hazard as shown on a FIRM map, is an extremely hazardous area due to the velocity of floodwaters, which carry debris, potential projectiles, and erosion potential. There are no regulatory floodways within the project boundaries.

#### *Development Standards for Lands Lying Within the Flood Hazard (FH) Zoning District*

Development standards for the allowable uses listed above for lands lying within the FH zoning district are the same as development standards for lands lying within the FHO zoning district (Section 3.4).

### ***Flood Hazard Overlay (FHO) Zoning District***

#### ***Applicability of the Flood Hazard Overlay (FHO) Zoning District***

The following areas shall be zoned FHO:

- All of those lands as designated on FEMA's FIRMs as Zone AO or AH (areas of shallow flooding), or lands designated as Zone A which are not included in a Flood Hazard zoning district.

#### ***Permitted uses:***

All uses permitted in the underlying zone shall be permitted in the FHO district, provided that a Floodplain Development Permit shall be obtained prior to commencement of construction and issuance of any other county entitlement.

### ***Trinity County General Plan Goals and Objectives***

The Trinity County General Plan contains goals and policies designed to guide the future physical development of the county, based on current conditions. The general plan contains all the state-required elements, including community development and design, transportation, natural resources, health and safety, noise, housing, recreation, economic development, public facilities and services, and air quality. The following goals and policies related to water resources issues associated with the Proposed Action were taken from the applicable elements of the general plan (Trinity County 2001), including the Douglas City Community Plan (1987).

#### ***County Wide Goals and Objectives***

##### ***Safety Element***

The following goals and objectives as well as policies are applicable to the Proposed Action.

##### ***Flood Hazard Goal***

Reduce loss of life and property by establishing development standards for areas subject to flooding.

- Require all development to meet federal, state and local regulations for floodplain management protection, including the encouragement of upgrading existing structures to meet adopted standards.
- Require all development to meet the development standards of the National Flood Insurance Act regulations in Title 44 of the Code of Federal regulations, Section 60.3, as implemented through the County Zoning Ordinance section 29.4.
- Maintain or return to Open Space lands subject to flooding.

#### ***Douglas City Community Plan Goals and Objectives***

The Douglas City Community Plan (Trinity County 1987) covers approximately 35 square miles (22,400 acres) centered around the Trinity River from Grass Valley Creek to slightly downstream of Steiner Flat.

### *Hazards*

This element of the Plan is intended to protect both private and public investments in structures and related improvements from flood hazards. Flooding has historically been the worst natural disaster within the Plan area. Therefore, the following goal is applicable to the Proposed Action:

**Goal:** To protect public and private developments from flood hazards

### *Project Consistency with the Trinity County General Plan*

This section compares the goals and objectives of the Proposed Action to the relevant local planning policies (i.e., Trinity County General Plan, Douglas City Community Plan) to determine if there are any inconsistencies.

The goals and objectives described in Chapter 1 are generally compatible with the applicable General Plan goals and policies summarized above. The overall goal of the Proposed Action is to rehabilitate the site so that it functions in a manner that is closer to historic conditions (e.g., pre-Lewiston Dam).

## 3.4.3 ENVIRONMENTAL CONSEQUENCES/IMPACTS AND MITIGATION MEASURES

### *Methodology*

The Proposed Action is designed to minimize placement of excavated material below the BFE. Hydraulic models were used to evaluate the alternatives described in Chapter 2, and a design criterion was developed to ensure that none of proposed activities would result in an obstruction to flow or an increase in the BFE by more than 12 inches. The three action alternatives evaluated in this document are designed to ensure that no increase in BFE over what currently exists would occur.

Also, to reduce the risk of loss of structures or injury or death of people within or adjacent to the project boundary, specific flood frequency flows and corresponding water surface elevations were calculated for the Proposed Action. This was necessary because specific hydrologic and hydraulic data were not available from the FEMA FIRM information and because of the age and datum used in the 1976 Corps study. The Location Hydraulic Study prepared by Reclamation identified 100-year frequency flood flows based on additional hydrologic data and assuming the full implementation of the flow regime prescribed in the ROD (U.S. Department of Interior 2000). To assess the sensitivity of the river to placement of material below the BFE, a hydraulic analysis was performed for each alternative to simulate the potential effects of the various activities. The analysis was performed to assess the sensitivity of the river to encroachments, not to assess the feasibility of a specific design.

### *Significance Criteria*

A project would have a significant impact related to water resources if it could subject people, structures, or other resources to substantial changes in flood hazards, or result in modification to and groundwater resources.

The Proposed Action would result in a significant impact to hydraulics if one of the following conditions occurred:



- an increase in the base floodwater surface elevation greater than 1 foot (12 inches);
- substantial alteration of the existing drainage pattern of a site or area, including through the alteration of the course of a stream or river, or substantial increase of the rate or amount of surface runoff in a manner that would result in flooding on- or off-site; or
- exposure of people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam.

The Proposed Action would result in a significant impact to groundwater if one of the following conditions occurred:

- a long-term decline in groundwater elevations (or a net reduction in groundwater storage) due to interference with recharge;
- detectable land subsidence;
- violation of any water quality standards of waste discharge requirements intended to protect groundwater quality; or
- detectable degradation of groundwater quality.

Groundwater impacts were assessed at the scale of a groundwater basin or sub-basin. The significance of declining (or increasing) water levels depends in part on the duration and permanence of the impact. Because groundwater elevations fluctuate naturally due to changes in rainfall, short-term changes in groundwater elevations are not considered significant impacts.

### Impacts and Mitigation Measures

Table 3.4-2 summarizes the potential water resources impacts that could result from construction of the project.

**TABLE 3.4-2** { TC "Table 3.4-2 Summary of Water Resources Impacts" \f B \l "1" }  
SUMMARY OF WATER RESOURCE IMPACTS FOR THE NO-ACTION ALTERNATIVE, THE PROPOSED ACTION, ALTERNATIVE 1, AND ALTERNATIVE 2

No-Action Alternative	Proposed Action	Alternative 1	Alternative 2	Proposed Action with Mitigation	Alternative 1 with Mitigation	Alternative 2 with Mitigation
<b>3.4-1. Implementation of the proposed project could result in a temporary or permanent increase in base floodwater surface elevation.</b>						
NI	LS	LS	LS	N/A <sup>1</sup>	N/A <sup>1</sup>	N/A <sup>1</sup>
<b>3.4-2. Implementation of the proposed project could result in a permanent decline in groundwater elevations, or permanent change in groundwater quality.</b>						
NI	LS	LS	LS	N/A <sup>1</sup>	N/A <sup>1</sup>	N/A <sup>1</sup>
<b>3.4-3. Implementation of the proposed project may expose people or structures to a significant risk of injury, death or loss involving flooding.</b>						
NI	LS	LS	LS	N/A <sup>1</sup>	N/A <sup>1</sup>	N/A <sup>1</sup>

LS = Less than Significant

S = Significant

SU = Significant Unavoidable

NI = No Impact

B = Beneficial

N/A = Not Applicable

<sup>1</sup>Because this potential impact is less than significant, no mitigation is required.

**Impact 3.4-1:** Implementation of the proposed project could result in a temporary or permanent increase in the base floodwater surface elevation. *No Impact for the No-Action Alternative; Less-than-Significant Impact for the Proposed Action, Alternative 1, and Alternative 2*

*No-Action Alternative*

Under the No-Action Alternative, the Trinity River floodplain within the site boundary established for the project site would not be altered and existing base floodwater surface elevations would remain the same.

*Proposed Action, Alternative 1, and Alternative 2*

Under all of the action alternatives, the elevation and aerial extent of the floodplain of the Trinity River would be modified through the activities described in Chapter Two. The hydraulics analysis indicates that by removing all the excavated material from the riverine rehabilitation areas and placing it above the BFE (in upland activity areas), there would be no increase in the FEMA BFE. Additionally, the Location Hydraulic Study indicates that there will be no increase to the FEMA BFE from temporary placement of low-flow channel crossings.

*Mitigation Measures*

*No-Action Alternative, Proposed Action, Alternative 1, and Alternative 2*

Since no significant impact was identified, no mitigation is required.

*Significance after Mitigation: N/A.*

**Impact 3.4-2:** Implementation of the proposed project could result in a permanent decline in groundwater elevations or permanent changes in groundwater quality. *No Impact for the No-Action Alternative; Less-than-Significant Impact for the Proposed Action, Alternative 1, and Alternative 2*

*No-Action Alternative*

Under the No-Action Alternative, the proposed project would not be implemented, and no effects on local groundwater levels would occur.

*Proposed Action, Alternative 1, and Alternative 2*

If any of the action alternatives is implemented, the displacement of channel and floodplain materials has a minimal potential to change the groundwater hydraulics within the site boundary. Groundwater table elevations and water volumes in nearby off-channel wetlands would not be affected because groundwater elevations in these areas are associated with river stage. The tendency of the surface water-groundwater system to move to equilibrium conditions, and the overall absence of impacts to the regional driving mechanisms of groundwater recharge (seasonal precipitation and Trinity River flow regimes), suggest that no long-term impacts on water table elevations are likely and that no significant impacts would occur.

*Mitigation Measures*

*No-Action Alternative, Proposed Action, Alternative 1, and Alternative 2*

Since no significant impact was identified, no mitigation is required.

*Significance after Mitigation: N/A.*

**Impact 3.4-3:** Implementation of the proposed project may expose people or structures to a significant risk of injury, death, or loss involving flooding. ***No Impact for the No-Action Alternative; Less-than-Significant Impact for the Proposed Action, Alternative 1, and Alternative 2***

*No-Action Alternative*

Under the No-Action Alternative, the proposed project would not be implemented, and no people or structures would be exposed to flood risks associated with the proposed project; therefore, no significant impact would occur.

*Proposed Action, Alternative 1, and Alternative 2*

Implementation of any of the action alternatives would not result in changes to the BFE. All of the action alternatives are designed to avoid exposing people or structures to a significant risk of injury, death, or loss involving flooding; therefore, no significant impact would occur.

*Mitigation Measures*

*No-Action Alternative, Proposed Action, Alternative 1, and Alternative 2*

Since no significant impact was identified, no mitigation is required.

*Significance after Mitigation: N/A.*

### 3.5 Water Quality

This section describes water quality conditions related to the Proposed Action from regional and local perspectives. The following evaluation is based on a review of existing literature and data, particularly the Water Quality Control Plan for the North Coast Region, as amended June 28, 2001 (Basin Plan) (North Coast Regional Water Quality Control Board 2001). Surface hydrology and groundwater issues are evaluated in Section 3.4, Water Resources; fisheries issues are evaluated in Section 3.6, Fishery Resources; and waters under the jurisdiction of the Corps are evaluated in Section 3.7, Vegetation, Wildlife, and Wetlands.

#### 3.5.1 AFFECTED ENVIRONMENT/ENVIRONMENTAL SETTING

##### Water Quality Management

###### *Basin Plan*

The Proposed Action is subject to compliance with the Basin Plan prepared by the Regional Water Board. The Basin Plan applies to the entire North Coast Region, which comprises all basins, including the Lower Klamath Lake and Lost River basins, draining into the Pacific Ocean from the California–Oregon state line south to the southern boundary of the watershed of the Estero de San Antonio and Stemple Creek in Marin and Sonoma Counties. The Trinity River is the largest tributary within the Klamath River basin. Section 3.4, Water Resources, provides additional discussion of the Trinity River and the tributaries that influence the project site. The Middle Trinity River Hydrologic Area is that portion of the watershed that is downstream of Lewiston Dam to the confluence of Browns Creek. The Lower Trinity River Hydrologic Area is that portion of the watershed that is downstream of Browns Creek.

The beneficial uses and water quality objectives for the Trinity River are contained in the Basin Plan. The beneficial uses pertinent to the Trinity River are listed in Table 3.5-1. This table also shows whether these beneficial uses currently exist or whether they have the potential to exist.

The beneficial uses impaired by excessive sediment in the Trinity River are primarily those associated with supporting high-quality habitat for fish. Recreation (contact and non-contact) is another important beneficial use potentially affected by various water quality parameters (e.g., sediment, temperature). Recreation activities in the general vicinity of Indian Creek include whitewater recreation, fishing, swimming, and sightseeing.

The Basin Plan identifies both numeric and narrative water quality objectives for the Trinity River. Table 3.5-2 summarizes the various water quality objectives by categories that have been established by the Regional Water Board to protect designated beneficial uses.

In addition to water quality objectives, the Basin Plan includes two waste discharge prohibitions that pertain to logging, construction, and associated nonpoint source activities:

- The discharge of soil, silt, bark, sawdust or other organic and earthen material from any logging, construction, or associated activity of whatever nature into any stream or watercourse in the basin in quantities deleterious to fish, wildlife, or other beneficial uses is prohibited.

- The placing or disposal of soil, silt, bark, slash, or sawdust or other organic and earthen material from any logging, construction, or associated activity of whatever nature at locations where such material could pass into any stream or watercourse in the basin in quantities deleterious to fish, wildlife, or other beneficial uses is prohibited.

**TABLE 3.5-1** { TC "Table 3.5-1 Trinity River Beneficial Uses" \f B \l "1"

}

**TRINITY RIVER BENEFICIAL USES**

<b>Beneficial Water Uses</b>	<b>Lower Trinity River Hydrologic Area</b>
Municipal and domestic supply	Existing
Agricultural supply	Existing
Industrial service supply	Existing
Industrial process supply	Potential
Groundwater recharge	Existing
Freshwater replenishment	Existing
Navigation	Existing
Hydropower generation	Potential and Existing
Water contact recreation	Existing
Non-contact water recreation	Existing
Commercial and sport fishing	Existing
Cold freshwater habitat	Existing
Wildlife habitat	Existing
Rare, threatened, or endangered species	Existing
Migration of aquatic organisms	Existing
Spawning, reproduction, and/or early development	Existing
Shellfish harvesting	Potential
Aquaculture	Potential and Existing
Native American culture	Existing

Source: Water Quality Control Plan for the North Coast Region. 2001. North Coast Regional Water Quality Control Board.

**TABLE 3.5-2**

WATER QUALITY OBJECTIVES FOR THE TRINITY RIVER{ TC "Table 3.5-2 Water Quality Objectives for the Trinity River" \f B \l "1" }

Category	Objective Threshold	Applicable Portion of Water Body
Bacteria	The bacteriological quality of waters of the North Coast region shall not be degraded beyond natural background levels. In waters designated for contact recreation, the median fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed 50/100 milliliters (ml), nor shall more than 10 percent of the total number of samples taken during any 30-day period exceed 400/100 ml.	Lower Trinity River
Biostimulatory substances	Water shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.	Entire Trinity River
Color	Water shall be free of coloration that causes nuisance or adversely affects beneficial uses.	Entire Trinity River
Chemical constituents	Waters designated for use as domestic or municipal supply shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels (MCLs) specified in the California Code of Regulations.	Entire Trinity River
Dissolved oxygen	Shall not be depressed below 8.0 mg/L and 50% or more of the monthly means for a calendar year must be greater than or equal to 10 mg/L.	Lower Trinity River
Floating material	Water shall not contain floating material, including solids, liquids, foams and scum in concentrations that cause nuisance or adversely affect beneficial uses.	Entire Trinity River
Oil and grease	Waters shall not contain oils, greases, waxes, or other materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses.	Entire Trinity River
pH	Shall not be depressed below 7.0 nor raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 in fresh waters with designated COLD or WARM beneficial uses.	Entire Trinity River
Pesticides	No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses. There shall be no bioaccumulation of pesticide concentrations found in bottom sediments or aquatic life. Waters designated for use as domestic or municipal supply shall not contain concentrations of pesticides in excess of the limiting concentrations set forth in the California Code of Regulations (CCR).	Entire Trinity River

**TABLE 3.5-2**

WATER QUALITY OBJECTIVES FOR THE TRINITY RIVER{ TC "Table 3.5-2 Water Quality Objectives for the Trinity River" \f B \l "1" }

Category	Objective Threshold	Applicable Portion of Water Body
Radioactivity	Radionuclides shall not be present in concentrations which are deleterious to human, plant, animal, or aquatic life nor which result in the accumulation of radionuclides in the food web to an extent which presents a hazard to human, plant, animal, or aquatic life.  Waters designated for use as domestic or municipal supply shall not contain concentrations of radionuclides in excess of the limits specified in the CCR.	Entire Trinity River
Sediment	The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.	Entire Trinity River
Settleable material	Water shall not contain substances in concentrations that result in the disposition of material that causes nuisance or adversely affects beneficial uses.	Entire Trinity River
Suspended material	Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.	Entire Trinity River
Tastes and odors	Water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses.	Entire Trinity River
Temperature	At no time or place shall the temperature of any COLD water be increased by more than 5° F above the natural receiving water temperature.  Temperatures will be consistent with those outlined in Table 3.5-3 of this EA/DEIR.	Trinity River subject to Interim Action Plan
Toxicity	All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life.	Entire Trinity River
Turbidity	Turbidity shall not be increased more than 20 percent above naturally occurring background levels.  Allowable zones of dilution within which higher percentages can be tolerated may be defined for specific discharges upon the issuance of discharge permits or waiver thereof.	Entire Trinity River

Source: Water Quality Control Plan for the North Coast Region. 2001. North Coast Regional Water Quality Control Board.

Two additional documents address specific elements of water quality in the Trinity River basin. The Interim Action Plan for the Trinity River incorporated into the Basin Plan addresses flow and temperature issues in that portion of the river affected by the TRD. The Trinity River Total Maximum Daily Load (TMDL) for Sediment (North Coast Regional Water Quality Control Board 2001) identifies the total load

of sediment that can be delivered to the Trinity River and its tributaries without exceeding water quality standards, based on current flow conditions and estimated flows under the ROD.

Principal components of the TRD include Lewiston Dam, Trinity Dam, and the facilities that divert runoff from the Trinity River watershed to the Sacramento River basin. Prior to full implementation of the ROD, construction of the dams and diversion facilities diverted up to 90 percent of the natural flows of the Trinity River and substantially altered water quality (i.e., temperature and sediment regimes). Additional information on this topic is provided in Section 3.4, Water Resources, and Section 3.6, Fisheries.

#### *Trinity River Water Quality*

The releases from the TRD influence flow volumes and velocities, water quality, and channel geometry downstream of Lewiston Dam. These influences are particularly important to water quality parameters such as temperature, turbidity, and suspended sediments. Water quality in the Trinity River is affected by acid mine drainage from abandoned mines and past mining activities; sediment releases from land use practices associated with unstable soils and decomposed granite (e.g., roads, vegetation management, subdivisions); septic tanks; aboveground and underground tanks; and lumber mills (North Coast Regional Water Quality Control Board 2001). The beneficial uses associated with coldwater fish habitat in the Trinity River basin are currently impaired.

Disturbance is a natural part of the riverine ecosystem that directly influences water quality and, therefore, beneficial uses. The beneficial uses associated with salmonid species are subject to natural fluctuation in response to disturbances. Anthropogenic activities can affect the severity and frequency of these disturbance processes. A dramatic decrease in the abundance of Trinity River coldwater fishes has taken place since the TRD began operation (B. Gutermuth, pers. comm. 2003).

#### *Temperature*

The influence of Trinity Lake and Lewiston Reservoir on stream conditions diminishes with distance downstream from the TRD. In general, the greater the release volumes from the dams, the less susceptible the river's temperature is to other factors. Releases from the TRD are generally cold (42 to 47 °F). These temperatures are transmitted through Lewiston Reservoir to the Trinity River below Lewiston Dam.

The Basin Plan, specifically Section 3, Table 5, and the Interim Action Plan define temperature objectives that apply to the Trinity River. These objectives are effective from July 1 through December 31 for the 40-mile reach between Lewiston Dam and the North Fork Trinity River. Table 3.5-3 lists these objectives, although the Basin Plan also stipulates that water released into the Trinity River may be no more than 5 °F warmer than receiving water temperatures.



**TABLE 3.5-3**

TEMPERATURE OBJECTIVES FOR THE MAINSTEM TRINITY RIVER{ TC "Table 3.5-3  
Temperature Objectives for the mainstem Trinity River"

{f B \l "1" }

Temperature	Dates	Trinity River Reach
60 °F (15.6 °C)	July 1 – September 14	Lewiston Dam to Douglas City Bridge
56 °F (13.3 °C)	September 15 – October 1	Lewiston Dam to Douglas City Bridge
56 °F (13.3 °C)	October 1 – December 31	Lewiston Dam to confluence with North Fork

Source: Water Quality Control Plan for the North Coast Region. 2001. North Coast Regional Water Quality Control Board.

### *Sediment*

The State of California has determined that the Trinity River is impaired under the provisions of Section 303(d) of the Clean Water Act (CWA) due to excessive sediment. The primary adverse impacts associated with excessive sediment in the Trinity River pertain to degradation of habitat for anadromous salmonids. The state water quality standards consist of designated uses, water quality criteria to protect the uses, and an antidegradation policy.

The TMDL for sediment describes how seasonal variation is considered. Sediment delivery in the Trinity River watershed has considerable inherent inter-annual and seasonal variability. Due to this variability in magnitude, timing, duration, and frequency of sediment input, the TMDL and load allocation apply to the sources of sediment and estimate average sediment input using a 10-year rolling average.

The TMDL does not allocate flow; however, it does take into account critical conditions for flow, sediment loading, and water quality parameters. Restriction of streamflow downstream of the TRD has greatly contributed to the impairment of the Trinity River below Lewiston Dam (U.S. Environmental Protection Agency 2001). Reduction in available coarse sediment upstream of Rush Creek and the significant contribution of fine sediment from Grass Valley Creek have combined to severely affect the sediment flux and particle size distribution in the river. These effects are observable downstream as far as the North Fork Trinity River.

### *Mercury in the Trinity River*

Another source of potential water quality impairment of the Trinity River is the presence of mercury, although the river is not listed under Section 303(d) of the CWA for mercury impairment. The general significance of mercury as a biological toxin, and the likely sources of mercury in regional and local contexts, is discussed in Section 3.15, Hazards and Hazardous Materials. Elevated concentrations of mercury have been found in water, sediment, and biota (fish, frogs, and predatory aquatic insects) in the upper Trinity River basin (U.S. Geological Survey, unpublished data). Biological samples taken in the lower Trinity River system have not yielded significantly elevated levels of mercury in biota from various trophic levels to date; however, studies that focus on the river downstream of the TRD and specifically the project site and vicinity are ongoing (Ashley et al. 2002).

Initially, the TRRP recognized the possibility of mercury releases from tailings and/or fluvial fine sediments that could be disturbed and mobilized by rehabilitation activities. Subsequently, on-going investigations and monitoring at the Hocker Flat Demonstration Project suggested that the alluvial materials that are subject to project-related disturbance contain levels of mercury well below the numeric criteria promulgated by the EPA for priority toxic pollutants. The levels are also well below the narrative threshold, which states that toxic substances should not be in such concentrations that produce detrimental physiological responses in humans or aquatic life. Under the California Toxics Rule, the numeric water quality objectives for total measured mercury are 0.050 parts per billion, unfiltered, for water.

Methylmercury concentrations in biological samples collected from the Hocker Flat area in April 2003 and 2004 were similar to background concentrations previously observed within the Trinity watershed. Dragonfly samples collected from seven Hocker Flat sites have methylmercury concentrations that range from 0.011 to 0.063 ppm (parts per million;  $\mu\text{g/g}$ ). Dragonflies collected from ponds had methylmercury concentrations similar to those from river sites. Other biota sampled, including amphibians and fish, show similar relationships. Furthermore, mercury concentrations in water that had leached through sediments of relatively high mercury levels remained low. While concentrations of mercury suggest some variability in the alluvial materials at Hocker Flat and the area downstream of Canyon Creek, the U.S. Geological Survey's (USGS's) assessment of site-specific methylation data suggests that the bio-availability of mercury is not presently high in the area.

### 3.5.2 REGULATORY FRAMEWORK

#### U.S. Environmental Protection Agency

##### *California Toxics Rule*

The EPA has promulgated numeric water quality criteria for priority toxic pollutants and other water quality standards provisions to be applied to waters in the State of California, known as the California Toxics Rule (CTR). EPA promulgated this rule based on the Administrator's determination that the numeric criteria are necessary in the State of California to protect human health and the environment. EPA promulgated this rule to fill a gap in California water quality standards that was created in 1994 when a state court overturned California's water quality control plans containing water quality criteria for priority toxic pollutants.

Under Section 303(c)(2)(B) of the CWA, states must adopt numeric criteria for the priority toxic pollutants listed under Section 307(a) if those pollutants could be reasonably expected to interfere with the designated uses of state waters. In April 1991, California adopted numeric criteria for priority toxic pollutants in the Inland Surface Water Plans and Enclosed Bays and Estuaries Plans. In 1994, the State of California was ordered to rescind these water quality control plans. Thus, the State of California was without numeric water quality criteria for many priority toxic pollutants as required by the CWA, necessitating the action by EPA. The federal criteria are legally applicable in the State of California for inland surface waters, enclosed bays, and estuaries for all purposes and programs under the CWA. The final rule promulgated numeric water quality criteria to replace the criteria that were rescinded by the state court. The State of California also remains under the jurisdiction of the National Toxics Rule

promulgated in 1992 for certain waters and pollutants (U.S. Environmental Protection Agency 2005), <http://www.epa.gov/ost/standards/ctr/factsheet.html>).

The CTR is set forth in the Federal Register (40 CFR 131, 2000; <http://www.epa.gov/ost/standards/ctr/toxic.pdf>). It establishes human health criteria for mercury in the water column of 0.050 parts per billion (ppb) of total recoverable mercury for drinking water supplies and aquatic organisms, and 0.051 ppb for waters that are not drinking water supplies. These criteria are derived from a calculated reference dose, based on concentrations of mercury below which extra risk for neurological damage should not occur.

#### *National Recommended Water Quality Criteria*

EPA has issued national recommended water quality criteria for the protection of aquatic life and human health for approximately 150 pollutants (U.S. Environmental Protection Agency 2004, <http://www.epa.gov/waterscience/pc/revcom.pdf>). These criteria are published pursuant to Section 304(a) of the CWA and provide guidance for states and Tribes to use in adopting water quality standards under Section 303(c) of the CWA. In 2001, EPA announced the availability of a recommended water quality criterion for methylmercury (66 FR 1344). At that time, EPA withdrew its previous ambient human health water quality criteria for mercury as the recommended Section 304(a) water quality criteria. (These criteria were the same as those set forth in the CTR, as described above.) The new water quality criterion describes the concentration of methylmercury in freshwater and estuarine fish and shellfish tissue that should not be exceeded to protect consumers of fish and shellfish among the general population. This concentration is set at 0.3 parts per million (ppm). The EPA expects the criterion recommendation to be used as guidance by states, Tribes, and the EPA in establishing or updating water quality standards for waters of the United States and in issuing fish and shellfish consumption advisories. This is the first time EPA has issued a water quality criterion expressed as a fish and shellfish tissue value rather than as a water column value. This approach is a direct consequence of the scientific consensus that consumption of contaminated fish and shellfish is the primary human route of exposure to methylmercury.

#### **Porter-Cologne Water Quality Control Act**

The Porter-Cologne Water Quality Control Act directs the Regional Water Board to formulate and adopt a Basin Plan for all areas within the region. The act requires the Regional Water Board to establish water quality objectives in the Basin Plan that in its judgment will ensure the reasonable protection of beneficial uses and the prevention of nuisance. Factors to be considered by the Regional Water Board in establishing water quality objectives shall include, but not necessarily be limited to, the following:

- past, present, and probable future beneficial uses;
- environmental characteristics of the hydrographic unit under consideration, including the quality of the water available thereto;
- water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area;
- economic considerations;

- the need for developing housing within the region; and
- the need to develop and use recycled water.

#### California Regional Water Quality Control Board

The Regional Water Board requires that a project proponent apply for and obtain a CWA Section 401 Water Quality Certification for any project that requires a CWA Section 404 permit from the Corps. Since any of the action alternatives would have the potential to affect water quality in the Trinity River, the Regional Water Board is likely to impose water quality limitations and project conditions through issuance of waste discharge requirements for Section 401 Certification. Reclamation will prepare and submit to the Regional Water Board an application for Section 401 Water Quality Certification and/or Waste Discharge Requirements (Dredge/Fill). The application will be submitted to the Regional Water Board when the pre-construction notification is sent to the Corps.

The Regional Water Board controls the discharge of wastes to surface waters through the National Pollutant Discharge Elimination System (NPDES) permit process. Waste Discharge Requirements are established in NPDES permits to protect beneficial uses. An NPDES General Permit for Storm Water Discharges Associated with Construction Activities (General Permit) is required for any of the action alternatives. The General Permit requires preparation and implementation of a Storm Water Pollution Prevention Plan (SWPPP) to help identify the sources of sediment and other pollutants that would affect the quality of storm water discharges and to describe and ensure the implementation of Best Management Practices (BMPs) to reduce or eliminate sediment and other pollutants in storm water as well as non-storm water discharges.

#### California Office of Environmental Health Hazard Assessment

If elevated levels of mercury are found to occur in fish species that are commonly considered sport fish, the California Office of Environmental Health Hazard Assessment (OEHHA) will issue a health advisory recommending safe consumption levels for possibly contaminated fish. Safe consumption limits for fish of various species from various localities with known toxic contamination hazards are listed by the OEHHA (<http://www.oehha.ca.gov/fish/general/99fish.html>). If risks from consumption of contaminated fish are judged to be high, people are advised to consume no fish from those areas. Mercury toxicity poses higher risks to pregnant or nursing women and to children under age six, so warnings may be specifically addressed to these population groups.

Human health water quality criteria are numeric values that EPA believes will protect human health for pollutant concentrations in ambient waters and edible tissue. Because consumption of contaminated fish tissue is the primary route of human exposure to methylmercury, EPA expresses this water quality criterion as a fish tissue value rather than as a water column value. The EPA human health fish tissue residue water quality criterion for concentrations of methylmercury in fish tissue is 0.3 milligrams methylmercury/kilogram fish (parts-per-million [ppm]) wet weight. The Food and Drug Administration (FDA) action level for commercial fish is 1.0 ppm. In 2003, the FDA revised its fish consumption advisory to equal the EPA standard. Black bass were collected from Trinity Lake in the Upper Trinity River watershed that exceeded these thresholds (May et al. 2002). It is thought that the inactive Altoona

Mercury mine, which drains into the East Fork Trinity River above Trinity Lake, is a significant contributor of mercury to the lake.

In addition, a preliminary investigation of Trinity Lake and several streams and ponds upstream has revealed elevated levels of mercury in certain fish populations. As part of an on-going investigation of mercury impacts from historic gold and mercury mining in the Trinity River watershed, the USGS has conducted a screening study of mercury concentrations in several fish species. While the mercury levels found are sufficient to warrant a Health Notification, the fish sample group in individual water bodies is limited and more study is needed (Office of Environmental Health Hazard Assessment 2005).

#### **Trinity County General Plan Goals and Objectives**

The Trinity County General Plan contains goals and policies designed to guide the future physical development of the county, based on current conditions. The General Plan contains all the state-required elements including land use, open space, transportation/circulation, housing, safety, noise, and conservation. No goals and policies relative to water quality issues specific to TRRP activities were identified in the General Plan (Trinity County 2001). The General Plan includes the Douglas City Community Plan (Trinity County 1987).

#### ***Douglas City Community Plan Goals and Objectives***

The Douglas City Community Plan does not identify specific goals and objectives that relate to water quality.

#### **Trinity County Water Quality Control Ordinance**

The Trinity County Water Quality Control Ordinance establishes the necessity to ensure the water quality of watersheds and water supply areas in Trinity County and dictates that “no use, application, discharge, disposal of any polluting substance or any other controllable water quality activities may be initiated, undertaken, or maintained by any person if said use or activity results in a detectable discharge of polluting substances into waters of the state located in or flowing through the county” (Ordinance #1072, County Code Section 8.60.010-8.6-020).

#### **Project Consistency with the Trinity County General Plan and Community Plans**

This section compares the goals and objectives of the Proposed Action to the relevant local planning policies (i.e., Trinity County General Plan, Douglas City Community Plan) to determine if there are any inconsistencies.

The goals and objectives described in Chapter 1 are generally compatible with the applicable General Plan goals and policies summarized above. The overall goal of the Proposed Action, Alternative 1, and Alternative 2 is to rehabilitate the site so that it functions in a manner that is closer to historic conditions (i.e., pre-Lewiston Dam).

### 3.5.3 ENVIRONMENTAL CONSEQUENCES/IMPACTS AND MITIGATION MEASURES

#### Methodology

Impacts on water quality were determined by analyzing whether the proposed modification of the physical features and biological conditions at the project site would comply with Basin Plan objectives for the Trinity River.

#### Significance Criteria

The proposed project would result in significant adverse impacts if it would result in any of the following:

- violations of state or federal numerical water quality standards or state or federal narrative water quality objectives for construction activities;
- substantial degradation of water quality, such that existing beneficial uses are precluded specifically because of adverse water quality;
- violation of any waste discharge requirements and/or Section 401 Certification conditions;
- substantial alterations of the course of a stream or river in a manner that would result in substantial erosion or siltation onsite or offsite;
- short-term or long-term increases in turbidity of 20 percent or more over naturally occurring background levels; or
- violation of site-specific temperature objectives for the Trinity River contained in the Water Quality Control Plan for the North Coast Region (North Coast Regional Water Quality Control Board, 1993, as amended) and included as Table 3.5-3 of this section.

#### Impacts and Mitigation Measures

Table 3.5-4 summarizes the potential water quality impacts resulting from construction and operation of the project.

**TABLE 3.5-4** { TC "Table 3.5-4 Summary of Water Quality Impacts" \f B \l "1" }  
SUMMARY OF WATER QUALITY IMPACTS FOR THE NO-ACTION ALTERNATIVE, PROPOSED ACTION, ALTERNATIVE 1, AND ALTERNATIVE 2

No-Action Alternative	Proposed Action	Alternative 1	Alternative 2	Proposed Action with Mitigation	Alternative 1 with Mitigation	Alternative 2 with Mitigation
<b>1. Construction of the project could result in short-term, temporary increases in turbidity and total suspended solids levels during construction.</b>						
NI	S	S	S	LS	LS	LS
<b>2. Construction of the project could result in short-term, temporary increases in turbidity and total suspended solids levels following construction.</b>						
NI	S	S	S	LS	LS	LS
<b>3. Construction of the project could potentially cause contamination of the Trinity River from hazardous materials spills.</b>						
NI	S	S	S	LS	LS	LS

**TABLE 3.5-4** { TC "Table 3.5-4 Summary of Water Quality Impacts" \f B \l "1" }  
SUMMARY OF WATER QUALITY IMPACTS FOR THE NO-ACTION ALTERNATIVE, PROPOSED ACTION,  
ALTERNATIVE 1, AND ALTERNATIVE 2

No-Action Alternative	Proposed Action	Alternative 1	Alternative 2	Proposed Action with Mitigation	Alternative 1 with Mitigation	Alternative 2 with Mitigation
<b>4. Construction and maintenance of the project could result in increased stormwater runoff and subsequent potential for erosion.</b>						
NI	LS	LS	S	N/A <sup>1</sup>	N/A <sup>1</sup>	LS
<b>5. Construction and maintenance of the project could result in the degradation of Trinity River beneficial uses identified in the Basin Plan.</b>						
NI	S	S	S	LS	LS	LS

Notes:

LS = Less than Significant      S = Significant      SU = Significant Unavoidable  
NI = No Impact      B = Beneficial      N/A = Not Applicable

<sup>1</sup>Because this potential impact is less than significant, no mitigation is required.

**Impact 3.5-1:** Construction of the project could result in short-term temporary increases in turbidity and total suspended solids levels during construction. *No Impact for the No-Action Alternative; Significant Impact for the Proposed Action, Alternative 1, and Alternative 2*

#### *No-Action Alternative*

Under the No-Action Alternative, the project would not be constructed; therefore, no construction-related short-term increases in turbidity or total suspended solids levels would occur.

#### *Proposed Action*

Implementing the Proposed Action would temporarily increase turbidity and total suspended solids in the Trinity River during the activities described in Chapter 2. During river's edge construction activities, increases in turbidity levels could occur as a result of excavation of riparian sediments and elevated floodplain materials, removal of riparian plant root systems, and re-shaping of the contours of the riverbanks. During in-river work, short-term increases in turbidity levels could occur as a result of removal and redistribution of alluvial materials. Fine sediments may be suspended in the river for several hours following construction activities. The extent of downstream sedimentation would be a function of the size and mobility of the substrate. For example, fine-grained sediments like silts and clays can be carried several thousand feet downstream of construction zones, while larger-sized sediments like sands and gravels would tend to drop out of the water column within several feet of the construction zone.

River's edge and in-river construction activities will be staged to minimize potential turbidity effects. However, the construction activities could result in short-term increases in turbidity and suspended solids concentrations in the water column that could violate the Basin Plan objectives for turbidity in the Trinity River. Short-term increases in turbidity and suspended solids levels would be a significant impact.

Low-flow channel crossings adjacent to R2 (Trinity River, X-1) and R9 (Weaver Creek, X-2) would provide access to river right activity areas R1, R8, R9, R10, U1, U2, and U3. Low-flow channel crossings will be constructed of appropriately sized alluvial materials. Size criteria for alluvial materials that would be used in the construction of low-flow channel crossings are defined further in Chapter 3.6. Placement of alluvial fill materials could temporarily increase turbidity and suspended materials during and immediately following construction of the crossing. Removal and distribution of alluvial materials upon deconstruction of the low-flow channel could also increase turbidity and suspended materials during and immediately following excavation.

#### *Alternative 1*

Temporary increases in turbidity or total suspended solids levels associated with construction of Alternative 1 would likely be similar to those under the Proposed Action. The primary difference between the Proposed Action and Alternative 1 is access to activity areas on the right side of the Trinity River. Under Alternative 1, access to these activity areas would be provided by a network of existing and new roads. A new access road will be constructed down the ridge to activity areas R-1, U-1, and U-2 using a skid trail constructed during installation of the Verizon phone line.

Construction and use of a new access road to the upstream activity areas would increase the potential for upland erosion and sedimentation. While this road follows a route (skid trail) that was constructed and subsequently abandoned, new construction, including excavation and placement of soil and rock, will be required to provide equipment access to these activity areas. Studies show that roads can contribute 50 to 80 percent of the sediment that enters streams (Hagans, Weaver, and Madej 1986). Additionally, surface erosion from roads can produce chronic sources of fine sediment, which can diminish salmon and steelhead spawning success (Cedarholm, Reid, and Salo 1981).

Similar to the Proposed Action, riverine activities would be staged to minimize potential turbidity effects. These activities could result in short-term increases in turbidity and suspended solids concentrations in the water column that could potentially violate the Basin Plan objectives for turbidity in the Trinity River. Short-term increases in turbidity and suspended solids levels during construction would be a significant impact.

#### *Alternative 2*

Temporary increases in turbidity or total suspended solids levels associated with construction of Alternative 2 would be less than under either the Proposed Action or Alternative 1. Exclusion of the riverine activities at R-1 (e.g., berm removal) and the ancillary activities (i.e., access, disposal of materials, staging) would substantially reduce the aerial extent of the project, thereby reducing the construction-related impacts to water quality at the upper end of the project.

As described in Chapter 2, riverine activities would be staged to minimize potential turbidity effects. These activities could result in short-term increases in turbidity and suspended solids concentrations in the water column that could potentially violate the Basin Plan objectives for turbidity in the Trinity River. Short-term increases in turbidity and suspended solids levels during construction would be a significant impact.



### ***Mitigation Measures***

#### ***No-Action Alternative***

Since no significant impact was identified, no mitigation is required.

#### ***Significance after Mitigation: N/A***

#### ***Proposed Action, Alternative 1, and Alternative 2***

- 1a.** Turbidity increases associated with activities shall not exceed the water quality objectives for turbidity in the Trinity River basin. Turbidity levels are defined in nephelometric turbidity units (NTUs). The current threshold for turbidity levels in the Trinity River, as listed in the Basin Plan for the North Coast Region (2001), is summarized below.
  - Turbidity shall not be increased by more than 20 percent above naturally occurring background levels. Allowable zones of dilution within which higher percentages can be tolerated may be defined for specific discharges upon the issuance of discharge permits or waiver thereof.
- 1b.** To ensure that turbidity levels do not exceed the threshold listed above during river's edge project construction activities, Reclamation or its contractor shall monitor turbidity levels 50 feet upstream and 500 feet downstream of the point of river's edge construction activities. At a minimum, field turbidity measurements shall be collected on a daily basis during river's edge construction (within 10 ft of the water line). Whenever a visible increase in turbidity is observed, monitoring frequency shall be a minimum of every 2 hours during this period.
  - If the grab sample results indicate that turbidity levels exceed the established thresholds identified in the Basin Plan, actions shall be implemented immediately to reduce and maintain turbidity at or below the thresholds. Potential remedial actions include temporarily halting construction activities and implementation of additional Best Management Practices (BMPs) until turbidity is at or below the thresholds.
- 1c.** Fill gravels used on the streambeds, stream banks, and river crossing will be composed of washed, spawning-sized gravels from a local Trinity Basin source. Gravel will be washed to remove any silts, sand, clay, and organic matter and will be free of contaminants such as petroleum products. Washed gravel will pass Caltrans cleanliness test #227 with a value of 85 or greater.
- 1d.** Reclamation or its contractor shall prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) that describes BMPs for the project, including silt fences, sediment filters, and routine monitoring to verify effectiveness. Proper implementation of erosion and sediment controls shall be adequate to minimize sediment inputs into the Trinity River until vegetation re-growth occurs. All BMPs and sediment and erosion control devices will be inspected daily during the construction period to ensure that the devices are properly functioning. Excavated and stored materials will be kept in upland sites with erosion control properly installed and maintained. Excavated and stored materials will be staged in stable upland sites. All applicable erosion control standards will be required during stockpiling of materials.

*Alternative 1*

**1e.** To minimize the potential for increases in turbidity and suspended sediments entering the Trinity River as a result of the new access road under Alternative 1, Reclamation or its contractor shall implement the following protocols. (To ensure that turbidity levels do not exceed the thresholds listed in 1a, see measure 1b listed above).

- Keep bare soil to an absolute minimum by using mulch, planting of native plants, hydroseeding, or other Type-D erosion control. Erosion control devices/measures shall be applied to areas where vegetation has been removed to reduce short-term erosion prior to the start of the rainy season. Soils shall not be left exposed during the rainy season.
- Keep runoff from bare soil areas well dispersed. Dispersing runoff keeps sediment on-site and prevents sediment delivery to streams. Direct any concentrated runoff from bare soil areas into natural buffers of vegetation or to gentler sloping areas where sediment can settle out.
- Disconnect and disperse flow paths, including roadside ditches, that might otherwise deliver fine sediment to stream channels

*Significance after Mitigation: Less than Significant.*

**Impact 3.5-2:** Construction of the project could result in short-term temporary increases in turbidity and total suspended solids levels following construction. ***No Impact for the No-Action Alternative; Significant Impact for the Proposed Action, Alternative 1, and Alternative 2***

*No-Action Alternative*

Under the No-Action Alternative, the proposed project would not be constructed; therefore, no short-term increases in turbidity or total suspended solids levels would occur following construction.

*Proposed Action*

The riverine activities described in Chapter 2 emphasize selective removal of fossilized riparian berms (berms that are anchored by extensive woody vegetation and consolidated sand deposits) and reconnecting the river's floodplain with the river at intermediate flows (between 450 and 6,000 cfs). These riparian berms developed after the TRD was completed as a result of the loss of scouring associated with peak flows. Removing the berms and vegetation at strategic locations will promote the river processes necessary for the restoration and maintenance of Trinity River alternate bars, thereby enhancing salmonid rearing habitat.

Implementing the Proposed Action could increase turbidity and total suspended solids in the river and on the floodplain following construction. Following construction, increases in turbidity levels could occur when newly excavated devegetated areas are exposed to rainsplash erosion and runoff, or erosion by elevated river stages if flows increase in the river. Fine sediments may be suspended in the river for several hours following such exposure and erosion. The extent of downstream sedimentation would be a function of the rainfall intensity and/or instream flow velocity, as well as the particle size of exposed

sediments. Lower intensity rainfalls would be less likely to mobilize fine sediments. Similarly, if fine sediments are mobilized by streamflow over newly exposed streambank areas, they could be carried several thousand feet downstream of the construction zones, while larger-sized sediments like sands and gravels would tend to drop out of the water column within several feet of the construction zone.

Post-construction exposure of sediments to rainfall and/or flows could result in short-term increases in turbidity and suspended solids concentrations in the water column that could potentially be in violation of the Basin Plan turbidity objective for the Trinity River. A short-term increase in turbidity and suspended solids levels following construction would be a significant impact.

#### *Alternative 1*

Access to activity areas will be provided through a network of roads (existing and new) necessary for the full range of vehicular traffic. Alternative 1 relies on the road network described in Chapter 2 to provide access to the activity areas on the right side of the Trinity River. No stream crossings (i.e., X-1 and X-2) are included in this alternative, thereby reducing the potential for direct discharge of alluvial material into the Trinity River and Weaver Creek. In cases where a new road will be constructed (i.e., R-1), this road will be constructed to address resource impacts, specifically erosion and runoff. Existing roads will be evaluated and upgraded as necessary to provide the necessary access. The new access road to R-1 will be decommissioned at project completion. New and existing roadways increase the potential for erosion and runoff post-construction. Even a short-term increase in turbidity and suspended solids levels following construction would be a significant impact.

#### *Alternative 2*

Under Alternative 2, the exclusion of R-1, Crossing X-1, and ancillary activity areas (U-1, U-2, C-1) on the right side of the Trinity River would substantially reduce the aerial extent of surface subject to erosional processes. While this alternative reflects reduced potential for post-construction impacts on water quality, the remainder of the activity areas still have the potential for erosion and runoff post-construction. Anticipated short-term increases in turbidity and suspended solids levels following construction would be a significant impact.

#### *Mitigation Measures*

##### *No-Action Alternative*

Since no significant impact was identified, no mitigation is required.

##### *Significance after Mitigation: N/A*

##### *Proposed Action, Alternative 1, and Alternative 2*

**2a.** Turbidity increases associated with activities shall not exceed the water quality objectives for turbidity in the Trinity River basin. Turbidity levels are defined in nephelometric turbidity units (NTUs). The current threshold for turbidity levels in the Trinity River, as listed in the Basin Plan for the North Coast Region (2001), is summarized below.

- Turbidity shall not be increased by more than 20 percent above naturally occurring background levels. Allowable zones of dilution within which higher percentages can be

tolerated may be defined for specific discharges upon the issuance of discharge permits or waiver thereof.

- 2b.** To ensure that turbidity levels do not exceed the threshold listed above following construction, Reclamation or its contractor shall monitor turbidity during and after rainfall events for the first year following completion of the project or until the road is properly decommissioned and adequately revegetated, to observe if erosion attributable to the access roads is resulting in increases in turbidity and total suspended solids in the Trinity River. At a minimum, field turbidity measurements shall be collected whenever a visible increase in turbidity is observed.
- If increases in turbidity and total suspended solids are observed as a result erosion from access roads, then field turbidity measurements shall be collected 50 feet upstream of a point adjacent to the end of the access road and 500 feet downstream.
  - If the grab sample results indicate that turbidity levels exceed the established thresholds identified in the Basin Plan, actions shall be implemented immediately to reduce and maintain turbidity at or below the thresholds. This would include addition of sediment control devices such as silt fences or sediment filters. The reason for, or source of, increased sediment input shall be identified and resolved to preclude further sediment input.

*Alternative 1*

- 2c.** To reduce the potential for the new access roads to continually contribute soil materials to the Trinity River following project construction, thereby increasing turbidity and total suspended solids in the river, the new access road from the SPI road used for access to R1, U1 and U2 under Alternative 1 shall be decommissioned upon completion of work in those areas. Decommissioning is defined as removing those elements of a road that reroute hillslope drainage and present slope stability hazards.

*Significance after Mitigation: Less than Significant*

**Impact 3.5-3:** Construction of the project could cause contamination of the Trinity River from hazardous materials spills. ***No Impact for the No-Action Alternative; Significant Impact for the Proposed Action, Alternative 1, and Alternative 2***

*No-Action Alternative*

Under the No-Action Alternative, the project would not be constructed; therefore, no construction-related contamination of the Trinity River from hazardous materials spills would occur.

*Proposed Action, Alternative 1, and Alternative 2*

Construction staging activities could result in a spill of hazardous materials (e.g., oil, grease, gasoline, solvents) into the Trinity River. In addition, operation of construction equipment within or adjacent to the river would increase the risk of a spill of hazardous materials into the river (e.g., from leaking of fluids from construction equipment). Spills of hazardous materials into or adjacent to the Trinity River could degrade water quality the Trinity River and have deleterious effects on salmonids of any life stage in close proximity to construction activities. Section 3.15, Hazardous Materials, evaluates potential effects associated with exposing the public to hazards associated with the transportation and use of hazardous

materials at the site. Construction activities could result in a spill of hazardous material, which would be a significant impact.

### ***Mitigation Measures***

#### ***No-Action Alternative***

Since no significant impact was identified, no mitigation is required.

#### ***Significance after Mitigation: N/A***

#### ***Proposed Action, Alternative 1, and Alternative 2***

- 3a.** Reclamation shall require that the contractor prepare and implement a spill prevention and containment plan in accordance with applicable federal and state requirements.
- 3b.** Reclamation shall include in the construction contract documents a requirement that any construction equipment that would come in contact with the Trinity River will need to be inspected daily for leaks prior to entering the flowing channel. External oil, grease, and mud will be removed from equipment using steam cleaning. Untreated wash and rinse water must be adequately treated prior to discharge if that is the desired disposal option.
- 3c.** Reclamation shall include in the construction contract documents a requirement that hazardous materials, including fuels, oils, and solvents, not be stored or transferred within 150 feet of the active Trinity River channel. Areas for fuel storage, refueling, and servicing will be located at least 150 feet from the active river channel. In addition, the construction contractor shall be responsible for maintaining spill containment booms onsite at all times during construction operations and/or staging of equipment or fueling supplies. Fueling trucks will maintain a spill containment boom at all times.

#### ***Significance after Mitigation: Less than Significant***

**Impact 3.5-4:** Construction of the project could result in increased stormwater runoff and subsequent potential for erosion. ***No Impact for the No-Action Alternative; Less-than-Significant Impact for the Proposed Action and Alternative 2; and Significant Impact for Alternative 1***

#### ***No-Action Alternative***

Under the No-Action Alternative, the proposed project would not be constructed; therefore, stormwater runoff and the subsequent potential for erosion would not increase.

#### ***Proposed Action and Alternative 2***

Implementation of the Proposed Action and Alternative 2 would not result in an increase in impervious surface areas (e.g., structures and roadway approaches) that could subsequently generate additional stormwater runoff and potential for erosion. New roads under these alternatives would be located on gentle terrain and would require minimal grading. The impact associated with runoff and erosion would, therefore, be less than significant.

#### *Alternative 1*

Implementation of Alternative 1 would require construction of approximately 2 miles of new access roads on steep slopes, which would require extensive grading. In cases where new roads are constructed, these roads will be constructed to the standard necessary to limit resource impacts, specifically erosion and runoff. Existing roads will be evaluated and upgraded as necessary to provide the necessary access. New roads will be decommissioned at project completion. New and existing roadways increase the potential for erosion and runoff post-construction. Even a short-term increase in storm water runoff and subsequent potential for erosion would be a significant impact.

#### *Mitigation Measures*

##### *No-Action Alternative, Proposed Action, and Alternative 2*

Since no significant impact was identified, no mitigation is required.

#### *Alternative 1*

- 4a.** See measure 2c above.

#### *Significance after Mitigation: Less than Significant*

**Impact 3.5-5:** Construction and maintenance of the project could result in the degradation of Trinity River beneficial uses identified in the Basin Plan. *No Impact for the No-Action Alternative; Significant Impact for the Proposed Action, Alternative 1, and Alternative 2*

##### *No-Action Alternative*

Under the No-Action Alternative, the project would not be constructed; therefore, no degradation of Trinity River beneficial uses identified in the Basin Plan would occur.

##### *Proposed Action, Alternative 1, and Alternative 2*

Under any of the action alternatives, significant impacts to beneficial uses of the Trinity River could occur in the following categories of water quality objectives listed in the Basin Plan:

- |             |                         |
|-------------|-------------------------|
| ▪ sediment  | ▪ settleable material   |
| ▪ toxicity  | ▪ suspended material    |
| ▪ turbidity | ▪ chemical constituents |

The magnitude of these impacts would be similar for the Proposed Action and Alternative 1. Under the Proposed Action, the impacts associated with the placement and deconstruction of the low-flow channel crossings (i.e., X-2 and X-2); under Alternative 1, the impacts would be associated with the construction of additional new road required to access activity areas R1, U1, and U2. Alternative 2 excludes activity areas R-1, X-1, U-1, and U-2; therefore, existing and new roads are not required to access this portion of the project. While Alternative 2 is anticipated to reduce the potential for impacts to beneficial uses, all of the action alternatives would result in significant impacts.

### ***Mitigation Measures***

#### ***No-Action Alternative***

Since no significant impact was identified, no mitigation is required

#### ***Proposed Action, Alternative 1, and Alternative 2***

The significance of impacts related to sediment, settleable materials, suspended materials, turbidity, and increased stormwater runoff and subsequent potential for erosion, as well as mitigation measures that would reduce the significance of these impacts are addressed under Impacts 3.5.1, 3.5.2, and 3.5.4. The significance of and mitigation for chemical constituents and toxicity impacts are addressed under Impact 3.5.3.

***Significance after Mitigation: Less than Significant.***